The Mineral Industry of Pennsylvania

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THE value of Pennsylvania's mineral industry increased 4 percent in 1963 to $856.9 million, the highest total since 1960. Continued resurgence of the bituminous coal and anthracite industries with a combined increase in value of production of $38.2 million was the prime factor in the upturn of the State's mineral economy. These two commodities comprised 59 percent of the value of the State's 1963 mineral output. Combined shipments of portland and masonry cements were virtually unchanged from those of 1962, but a tight cement market forced price cuts and the value of shipments dropped 8 percent. Production of all metals increased, most notably copper, zinc, and iron ores. A firm market for roadbuilding aggregate held production of paving sand and gravel and crushed stone aggregate at high levels. However, there was a slackened demand for sand and gravel aggregates in construction of both private and public buildings. Production of dimension construction stone also decreased. Clay production increased 11 percent mainly because of increased demand for clay refractories.

Washington County with large production of bituminous coal led in value of mineral production. Other leading counties in descending order of value of production, with their leading commodity given in parentheses are as follows: Northampton (cement), Luzerne (anthracite), Green (bituminous), and Schuylkill (anthracite).

A constant dollar series has been prepared in which the bias caused by price level variations is reduced, thus showing more nearly the real change in the annual value of mineral production. The series is constructed by summing the constant dollar value of several mineral groups. These groups were converted to 1957–59 constant dollars by dividing the group current dollar value by the appropriate group implicit price deflator.

Legislation and Government Programs.—On July 16 a new bituminous strip mine law was signed into effect. In summary, the law requires that all areas stripped after January 1, 1962, be restored to contour, except in exceptional cases when appeals may be made by the stripper to the Land Reclamation Board, which was created by the law. Ter-

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race backfilling will be permitted in mountainous terrain, provided the highwall is slanted at an angle no steeper than 45 degrees. Other requirements include a $100 boost in per-acre bonds to $500, a State license for each strip mine owner and strip mine permits for each operation, prefiling of reclamation plans, and maintenance of equipment at an abandoned mine until reclamation work is completed. The definition of abandoned mine was changed to one where operations have been halted for 6 months from the former time limit of 1 year.

A new strip mine law for anthracite also was passed which called for complete backfilling on anthracite pits, rather than the former 100-foot limit, and establishment of a board for enforcement of the new law.

TABLE 1.—Mineral production in Pennsylvania [1]

Mineral	1962		1963	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:				
Portland—thousand 376-pound barrels	38,463	$127,969	38,316	$118,203
Masonry—thousand 280-pound barrels	2,565	7,105	2,510	6,611
Clays [2]—thousand short tons	2,893	12,815	3,191	14,717
Coal:				
Anthracite—do	16,894	134,094	18,267	153,503
Bituminous—do	65,315	331,298	71,501	350,085
Copper—short tons	(3)	(3)	4,434	2,731
Gem stones	(4)	4	(4)	4
Lime—thousand short tons	1,104	16,647	1,188	17,548
Natural gas—million cubic feet	90,053	24,494	92,657	24,091
Natural gas liquids:				
Natural gasoline—thousand gallons	1,350	75	1,311	78
LP gases—do	1,521	112	1,721	118
Peat—short tons	32,936	369	33,952	339
Petroleum (crude)—thousand 42-gallon barrels	5,302	24,230	[5] 4,963	[5] 22,631
Sand and gravel—thousand short tons	14,419	23,587	14,066	23,539
Stone—do	48,144	82,087	49,536	83,450
Zinc [6] (recoverable content of ores, etc.)—short tons	24,308	5,652	27,389	6,572
Value of items that cannot be disclosed: Clays (kaolin), cobalt, gold, iron ore, mica, pyrites, sericite schist, silver, tripoli, and values indicated by footnote 3		32,966		32,644
Total		[7] 823,504		856,864

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes kaolin; included with "Value of items that cannot be disclosed."
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Weight not recorded.
[5] Preliminary figure.
[6] Recoverable zinc valued at the yearly average price of Prime Western slab zinc, East St. Louis market. Represents value established after transportation, smelting, and manufacturing charges have been added to the value of ore at the mine.
[7] Revised figure.

TABLE 2.—Value of mineral production in constant 1957–59 dollars

(Thousands)

Year	Value	Year	Value
1952	$1,178,969	1958	$889,040
1953	1,134,570	1959	890,632
1954	990,705	1960	862,002
1955	981,731	1961	838,713
1956	1,105,382	1962	868,551
1957	1,057,845	1963	903,737

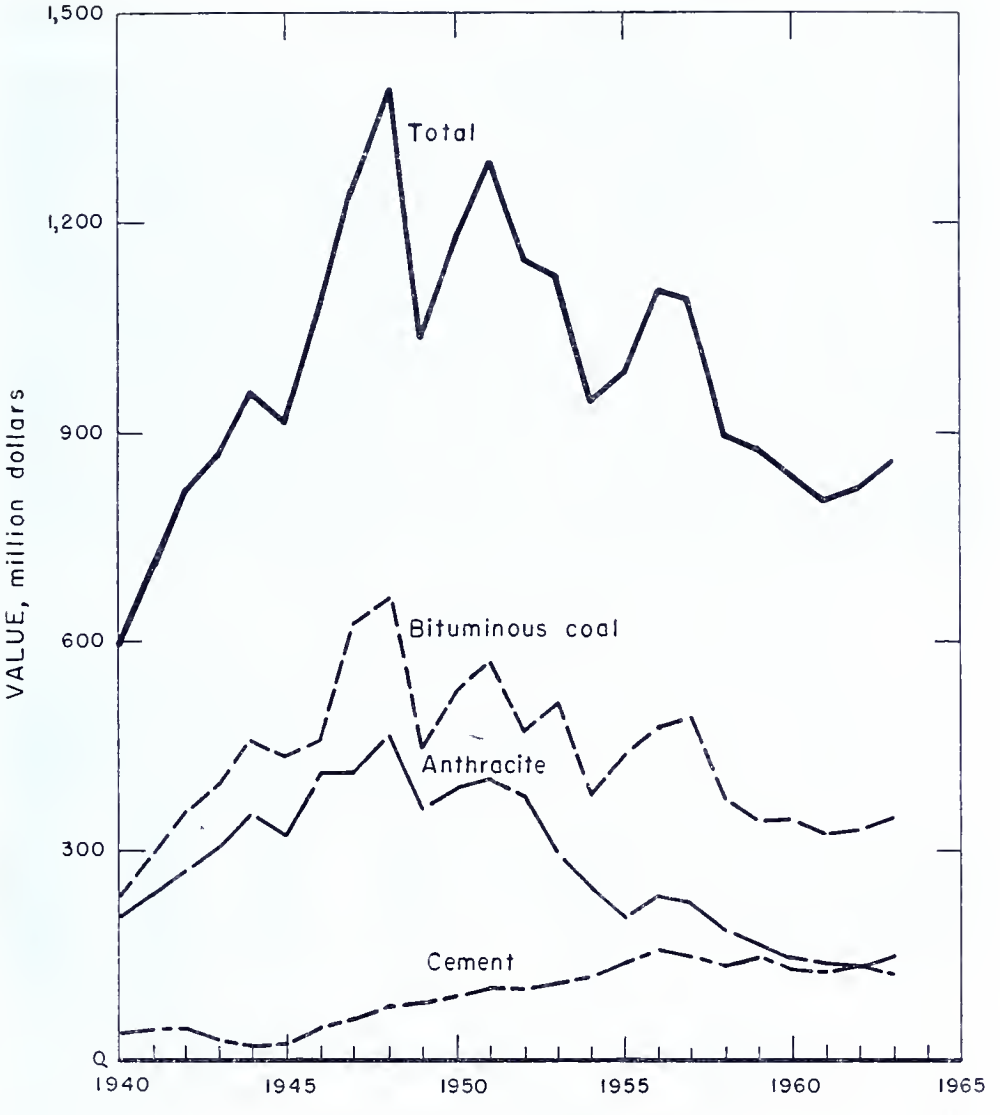

FIGURE 1.—Value of bituminous coal, anthracite, cement, and total value of mineral production in Pennsylvania, 1940–64.

The first project in a new joint State-Federal conservation program was the planned expenditure of $775,000 at Wilkes-Barre to fill in abandoned workings which threaten to cause subsidence damage to a residential area. The new law states that the Federal and State governments share the cost of filling or sealing anthracite mines that threaten public health and safety. Also a part of the program is action to control drainage into anthracite formations.

The Federal Bureau of Mines cooperated with the State under the Accelerated Public Works Program in controlling an anthracite mine fire at Coal Run.

The State Oil and Gas Conservation Commission, Department of Mines and Mineral Industries conducted seven hearings during the year and issued four spacing orders. The Commission established by a 1961 law, has the primary function to control drilling and

plugging of oil and gas wells, exercising particular control over drilling in areas of workable coal seams.

Water.—Almost 93 billion gallons of water was used by Pennsylvania mineral industries in 1962, mainly in mining and processing of metal and nonmetallic minerals, in stone milling, bituminous coal and anthracite washing, and in processing natural gas liquids. In addition, 6.9 billion gallons of water was used in secondary recovery of petroleum, and 30 million gallons was used by petroleum and natural gas well drilling contractors, bringing the total to almost 100 billion gallons. Of total new water used 12.3 billion gallons was fresh (potable) water and 36.8 billion gallons was contaminated. A large quantity (53 billion gallons) of water, after use, was pumped to tailings ponds and after settling, was recirculated, thus reducing new water requirements and averting stream pollution, thereby helping conserve a vital natural resource. Recirculation was especially prevalent in the anthracite and bituminous coal industries. A total of 27.4 billion gallons was treated, the leading methods of which were filtering, pH control, bactericide additions, and chlorination.

TABLE 3.—Water use in the mineral industry in 1962

(Million gallons)

Industry	New water	Recirculated water	Total water used	Discharged water	Consumed water	Gallons of new water per dollar value of production
Quarries and mills	11,976	1,291	13,267	11,538	438	145.70
Coal, anthracite	16,938	14,930	31,868	15,585	1,353	128.67
Coal, bituminous	2,682	23,483	26,165	1,914	768	13.47
Metal mines and mills	3,095	6,293	9,388	2,391	704	80.85
Nonmetal mines and mills	25	11	36	25		1.94
Sand and gravel plants	6,996	4,907	11,903	6,615	381	296.60
Natural gas liquids plants	260	81	341	249	11	1,390.65
Total	41,972	50,996	92,968	38,317	3,655	85.99

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal (Anthracite).—Exports of anthracite, which increased 86 percent, was the leading factor in the 8-percent rise in anthracite production in 1963, reversing a downward trend for the 1st year since 1956. Exports were shipped chiefly to Canada and Western Europe. Consumption of anthracite at coke plants increased 7 percent but retail deliveries, the most important market tonnagewise, decreased 15 percent from that of 1962. Consumption by electric utilities decreased 6 percent. Average prices per ton increased with greater demand rising $0.46 to $8.40.

Of the total production of 18.3 million tons, 78 percent was fresh mined coal, 19 percent was from culm banks, and 3 percent was from river dredges. Of the fresh mined coal, 53 percent was from strip pits; 47 percent from underground mines. Production from dredges, which operated chiefly on the Susquehanna River, was 5 percent less than that of 1962. Of the underground production, 3.7 million tons

(55 percent) was loaded mechanically; the balance was hand loaded. The number of scraper loaders in use increased by 19 to 147, and the tons loaded by this method increased 59 percent. There were 4 fewer mobile loaders in use in 1963, but production by the remaining 30 was slightly greater than in 1962. Twenty-four fewer conveyors (512) including duckbills and self-loading conveyors loaded 12 percent more than in 1962. Rail shipments increased 18 percent to comprise 51 percent of the total. Truck shipments were slightly less than in 1962. Luzerne and Schuylkill were the leading producing counties followed by Northumberland and Lackawanna Counties.

The average number of men working daily dropped by 512 to 13,498. However, because of an increase of 12 days in number of days active, the total labor increased 2 percent to 2.9 million man-days. Total productivity increased to 6.27 from 5.92 tons per man-day. Productivity at dredges was 26.77 tons per man-day, at all other operations 6.09 tons per man-day. Productivity was the greatest in the Lehigh region because of the predominance of strip mining. Fewer men were employed in Schuylkill and Lackawanna Counties, but more were working in Northumberland and Luzerne Counties.

There were 32 fatalities at Pennsylvania anthracite mines in 1963, 6 more than had occurred in 1962. Injury frequency rates were 1.66 per million tons of coal produced and 1.70 per million man-hours of exposure, an increase of 9 percent and 35 percent, respectively. Underground fatalities increased by 9 to 27 in 1963. Falls of roof, face, or rib claimed 13 lives, explosions and explosives accounted for 5 and 3 fatalities, respectively. Surface operations at underground mines reported 2 fatalities, and strip mines reported 3 fatalities.

A spectacular mine rescue was successfully attempted at an underground anthracite mine near Shippton, Pa., where three miners were trapped in a cave-in on August 13. A completely new method of rescue was used, in which a bore hole was drilled to the area of the entrapped miners, the hole enlarged, and two of the men were hoisted to the surface by a harnessing arrangement.

Work continued in the long fight to extinguish burning culm dumps and to reduce acid formation in mining operations. In addition, State programs were active in correcting conditions caused by early mining operations which are detrimental to public welfare. Such programs included sealing mine openings at abandoned underground mines, backfilling abandoned open-pit mines, and extinguishing mine fires.

Coal (Bituminous).—Responding to increased demand by the electric utility market, the State's bituminous coal industry increased production by 9 percent to 71.5 million tons, the highest level since 1957. Captive coal production, however, decreased slightly despite the high rate of steel production, reflecting increasing efficiency in both the production of coke and its consumption in the blast furnace. Continued cost cutting and closing of inefficient mining operations was reflected in decreased values from $5.07 to $4.90 per ton f.o.b. mine.

Of the total production, 65 percent was mined at 592 underground mines, 34 percent at 521 strip mines, and 1 percent at 69 auger mines. There were five more mines active than in 1962. Shipments were 78 percent by rail or water, 20 percent by truck, and the balance by other

means. Captive production comprised 33 percent of total output. Mechanical cleaning plants prepared 62 percent of total production, of which 68 percent was prepared by wet washing methods other than jigs, 17 percent by jigs, and 15 percent by pneumatic methods. Eighty-nine preparation plants were active, two less than in 1962. At 16 of these preparation plants, 4.9 million tons of coal fines were thermally dried. Of the total State production, 55 percent was crushed and 8 percent was treated, chiefly with oil and salt or combinations of the two, for dust allaying and antifreezing purposes.

Of the underground production, 71 percent was mined and loaded by 337 continuous mining machines, a decrease of 18 machines from the number used in 1962. In addition, 28 percent of the underground production was cut by 665 cutting machines. A small quantity was shot from the solid or cut by hand. Coal drilling was by 536 hand-held or post-mounted drills and 50 mobile drills. Roof bolting was accomplished by 236 rotary and 306 percussion drills. Miscellaneous drilling functions were performed with 119 other drills. Underground main line haulage was handled by 1,430 trolley locomotives, 100 battery-powered locomotives, and 28 mother locomotives, over a total of 901.2 miles of main line track and 323.4 miles of working section track. In addition to the track haulage, 403 other conveyors, each an average of 1,599 feet, carried large tonnages. Intermediate underground haulage was by 918 cable reel and 33 battery shuttle cars plus 31 of the smaller shuttle buggies. Mechanical loading was used at 234 of the underground mines and mechanically loaded tonnage comprised 96 percent of the total. Continuous mining machines accounted for 74 percent of this total, and mobile loading machines accounted for 24 percent. There were 277 mobile loaders in use, of which 198 loaded into shuttle cars, 59 operated behind continuous mining machines, 12 loaded into mine cars, and 8 loaded onto conveyors. The balance of the mechanical loading was done by 13 duckbills and 196 hand-loaded face conveyors.

Equipment at the 521 strip mines included 920 power shovels and 420 dragline excavators, most of which were disel powered and less than 3 cubic yards in capacity. However, 15 of this total were the large plus-12-cubic-yard units. In addition, in use were 813 bulldozers, 116 horizontal and 129 vertical overburden drills, 23 carryall scrapers, and 1,582 trucks which averaged 13 tons capacity. At the 69 auger mines, 79 augers were in use serviced by 107 trucks which averaged 14 tons capacity.

There were 22 fatal and 990 nonfatal injuries in the bituminous coal industry in 1963, a reduction of 37 in number of fatals but an increase of 40 in nonfatal injuries. Injury rates were 0.31 fatal and 14.00 nonfatal per million short tons and 0.50 fatal and 22.36 nonfatal per million man-hours of exposure. There was an average of 26,400 men employed, working an average of 208.7 days, a total of 443 million man-hours. This was an increase of 4,700 in average number of men employed and 66 million man-hours over 1962. The State's injury rates were well under the average for the Appalachian field and for the Nation as a whole.

At underground mines 10 men were killed by falls of roof, 1 man by fall of face or rib, and 6 men in haulage accidents. At strip mines

one man was killed by machinery and two by miscellaneous causes. At auger mines one man was killed by machinery and one by miscellaneous causes.

The unit train concept of coal transportation became more of a reality on April 1, 1963, as the Pennsylvania Railroad reduced freight rates up to $1.50 per ton on shipments of not less than 7,000 tons to a single destination.

Plans were announced for constructing a $175 million coal-burning electric generating station in Armstrong County 35 miles northwest of Johnstown. Jersey Central Power & Light Co., Philadelphia Electric Co., and Pennsylvania Power & Light Co. will jointly construct a 1.6-million kilowatt generating plant.

TABLE 4.—Coal (bituminous) production, by counties

(Thousand short tons and thousand dollars)

County	1962		1963	
	Quantity	Value	Quantity	Value
Allegheny	4,843	$27,946	4,436	$23,876
Armstrong	3,524	16,041	4,150	16,420
Beaver	634	2,062	452	1,476
Bedford	354	1,242	317	1,099
Blair	78	320	13	59
Butler	2,227	7,973	1,902	6,964
Cambria	5,885	34,225	6,955	37,575
Cameron	(1)	(1)	68	265
Centre	729	2,765	759	2,547
Clarion	3,492	12,159	3,711	12,717
Clearfield	6,601	24,569	6,890	25,080
Clinton	407	1,513	481	1,588
Elk	457	1,686	673	2,443
Fayette	1,293	6,088	1,560	7,410
Greene	9,128	57,030	9,615	59,373
Huntingdon	30	123	53	180
Indiana	4,822	23,388	5,588	25,968
Jefferson	1,382	4,791	1,802	6,326
Lawrence	651	2,000	897	2,772
Lycoming	39	125	29	115
Mercer	1,125	4,244	982	3,719
Somerset	2,410	9,599	3,120	11,873
Tioga	(1)	(1)	386	1,727
Venango	295	935	678	2,332
Washington	10,926	69,790	12,153	76,836
Westmoreland	3,570	18,971	3,857	19,164
Undistributed [2]	413	1,713	34	181
Total	65,315	331,298	71,501	350,085

[1] Included with "Undistributed."
[2] Includes Bradford and McKean (1963) Counties, and counties indicated by footnote 1.

Coke and Coal Chemicals.—Responding to the expanded needs of an active iron and steel industry, oven-coke production increased 9 percent over that of 1962. Twelve plants were in operation with 3,720 slot ovens, the same as in 1962. Oven-coke production comprised 98 percent of total coke output. Beehive-coke production was slightly less than in 1962; 18 plants had 3,636 ovens in operation, a decrease of 2 plants and 282 ovens from the number in operation in 1962. The State continued to be first ranking in coke production with output comprising 29 percent of the National total and production more than twice that of the next ranking State.

Value of oven-coke production was $227.3 million, an average value of $14.91 per ton at the ovens, a decrease of $1.45 per ton from that

of 1962. Average value of coal carbonized was $8.45, a decrease of $0.37 per ton from that of 1962. Beehive coke was valued at an average of $13.99, an increase of $0.32 per ton from that of 1962.

To produce 15.2 million tons of oven-coke, 21.9 million tons of coal was carbonized, a yield of 69.6 percent. To produce 1 ton of coke, 1.44 tons of coal was required. Yield of coke from coal at beehive ovens was 61.5 percent. Production figures by State of the coal carbonized at oven-coke plants are as follows: 53 percent was produced within the State (chiefly in the Pittsburgh field), 40 percent originated in West Virginia, 6 percent in Virginia, and 1 percent in Kentucky. Most of the coal was high volatile (72 percent), low volatile (20 percent), and medium volatile (8 percent).

Coke production was consumed mainly (98 percent) in blast-furnace plants within the State. Heating units at coke plants used 39 percent of the coke-oven gas produced. Steel or allied plants used 82 percent of the remainder, 15 percent was used under boilers, and the balance was sold. Coke breeze was consumed chiefly in agglomerating plants (74 percent) and in steamplants (16 percent). The balance was used for other industrial applications or was sold.

Recovered products at the oven-coke plants included 739,536 tons of coke breeze (a yield of 3.38 percent per ton of coal), 232.0 billion cubic feet of coke-oven gas, 212,246 tons of ammonium sulfate equivalent, 209.4 million gallons of coke-oven tar, 65.6 million gallons of crude light oil (from which was derived 36.6 million gallons of benzene), 9.5 million gallons of toluene, 3.2 million gallons of xylene, and 2.2 million gallons of solvent naphtha (crude and refined).

Peat.—Sharply reduced selling prices characterized the peat industry in the State in 1963. Average value per ton of sales dropped $1.22 to $9.97. Production which was 36 percent greater than that of 1962 was reported by seven producers in five counties. Luzerne and Wayne Counties were the leading peat-producing areas. Moss, humus, and reed-sedge peat was mined, processed, and sold both in bulk and in packaged units. According to the Federal Geological Survey, reserves of peat at the 332 acres of active operations was 1,575,400 tons.

Petroleum and Natural Gas.—Despite increased drilling activity, the production of crude petroleum decreased from 5.3 to 5.0 million barrels, valued at $22.6 million. Natural gas production, however, increased from 90.0 billion to 92.7 billion cubic feet, valued at $24.1 million. Petroleum prices remained at virtually the 1962 rates, but average prices for natural gas decreased 4 percent in 1963.

There were 700 new wells drilled and 26 wells deepened in 1963; 672 were in proven fields and 28 were exploratory tests. There was a total of 205 wells for secondary-recovery projects, 6 were gas storage wells, 210 were gas wells, 198 were oil wells, and 81 were dry holes. The total footage drilled during the year was 1,727,051 feet.

Exploration resulted in discovery of three new gas fields, one new gas pool, and four successful deeper pools. Exploratory drilling totaled 166,388 feet of hole. Eight of the 28 exploratory wells were successful and 20 were dry.

During the year, 109 deep wells (Middle Devonian or older) were drilled, bringing the total number of deep wells to 2,413. Of these,

1,375 were gas wells, 6 were oil and gas wells, 955 were dry holes, 75 were for gas storage, and 2 were for waste disposal. Of the 109 deep wells, 34 were Oriskany gas wells, 32 were Medina gas wells, 40 were dry holes, 2 were gas storage, and 1 was for waste disposal. Total footage was 631,838 feet, an average of 5,797 feet per well. Ninety of the deep tests were drilled with rotary tools, the remaining 19 with cable tools. Crawford County in northwestern Pennsylvania had the greatest density of deep drilling with 24 completions; Indiana County was second with 18 deep wells.

Shallow-sand development (Upper Devonian and younger) accounted for the drilling of 617 holes in 1963 (15 more than 1962), in the following categories: 205 wells for secondary recovery, 3 gas wells for storage, 144 wells for gas, 198 wells for oil, 42 dry holes, and 25 wells drilled deeper. Of the 25 holes drilled deeper, 22 were gas wells, 2 were oil wells, and one was a dry hole. Including the deepened holes, the shallow-sand wells averaged 1,775 feet per well. One hundred and twenty-two of the 144 gas wells were subjected to reservoir stimulation which in some cases increased the initial open flow potential as much as 1,400 percent. Average initial open-flow potential of shallow gas wells was 509,000 cubic feet per day. Of the 198 new oil wells, the average daily production was 61 barrels, largely because of the relatively high initial potentials of wells drilled in the Youngsville-Sugar Grove area, Warren County, where fracturing of the Glade sand has been very successful. No new shallow-sand gas fields or pools were discovered in 1963. Shallow well completions in 1963 were centered in Warren County which had 162 completions of which 151 were oil, 3 were gas, and 8 were dry holes. Indiana County was a distant second with 62 completions. Other significant shallow-well activity was in Armstrong (29 completions), Venango (28), Westmoreland (25), and Clarion (20).

There were 198 new oil wells completed in 1963, a sharp increase over the 97 new oil wells drilled in 1962 and the 43 drilled in 1961. This resurgence in oil well drilling activity was mainly attributed to successful results of new and improved completion techniques such as notching and hydrofracturing. Daily oil production from an estimated 54,023 wells (1,406 less than in 1962) averaged 13,737 barrels, about 0.25 barrel per well per day, a decrease of 4 percent below 1962. The Pennsylvania portion of the Bradford field (86 percent of the field area) produced 66 percent of total State production. Daily oil production from the middle and southwestern districts increased 19 percent over that of 1962. This increase was due to the development of the Youngsville-Sugar Grove area, Warren County, where fracturing has been successfully applied to the Glade sand.

The 144 new gas wells drilled (137 in 1962) had a 9 percent increase in total initial open-flow capacity over that of 1962. The greatest gas well drilling activity was in Indiana County with 58 wells. Armstrong County had 27, Westmoreland 18, and Clarion 14. One of the more significant deep gas well completions was one at 7,710 feet in Westmoreland County.[2]

[2] Lytle, William S. Oil and Gas Developments in Pennsylvania in 1963. Bull. of the Am. Assoc. of Petro. Geol., v. 48, No. 8, June 1964, pp. 784–800.

According to the American Petroleum Institute and the American Gas Association, proved recoverable reserves of crude oil were 91,734,000 barrels and reserves of natural gas were 1,214 billion cubic feet as of December 31, 1963. Of the natural gas reserve, 491 billion cubic feet was in underground storage. Pennsylvania has an estimated storage capacity of 658 billion cubic feet, or an estimated 17 percent of the U.S. total. Storage of natural gas is accomplished by 10 operating companies in 56 fields or areas scattered through 14 or more counties.[3]

As of January 1, 1963, Pennsylvania had a total of 13 refineries with a crude capacity of 675,000 barrels per calendar day producing a full range of petroleum products except coke.

Natural Gas Liquids.—Production of liquefied petroleum gases increased 13 percent to 1.7 million gallons, but output of natural gasoline decreased 3 percent to 1.3 million gallons. Average prices per gallon for natural gasoline were up to $0.059 from $0.056 in 1962, but for liquefied petroleum gases average prices per gallon dropped from $0.074 in 1962 to $0.069 in 1963.

According to the American Gas Association, total reserves of natural gas liquids including condensate, natural gasoline, and liquefied petroleum gases as of December 31, 1963, were 1.4 million barrels.

NONMETALS

Cement.—Tight markets and depressed prices for cement, particularly along the eastern seaboard, characterized the cement industry in 1963. The industry operated at 71 percent of capacity, and the production of portland cement was at virtually the same rate as in 1962. However, the value of production decreased 8 percent as average prices dropped $0.25 to $3.08 per barrel. Masonry cement output was 2 percent less than in 1962, but value of production was down 7 percent as price cuts also were in effect for masonry cement.

Overly abundant supplies of cement saturated the markets along the eastern seaboard because of increased shipments from a large-capacity new plant in the East. Price cuts and extended time allowances for cash sales were two of the steps taken by cement manufacturers to retain customers. This was particularly true for eastern counties where most of the price reductions were in effect. The western counties were virtually unaffected. A new labor contract with increased wages and improved pension and insurance benefits went into effect for most of the industry on May 1, 1963.

There were 22 cement plants with 106 rotary kilns active, of which 14 used the dry process (65 percent of capacity), 7 used the wet process, and 1 had a combination of both. Of total energy requirements, 199.4 million kilowatt hours was generated by the cement companies and 753.8 million kilowatt hours was purchased. Stocks of portland cement decreased from 6.04 to 5.84 million barrels.

Cement rock and limestone were the chief raw materials for cement manufacture, totaling 10.9 million tons and comprising 91 percent of total requirements. Other raw materials included gypsum (309,668 tons), slag (225,901 tons), sand (210,579 tons), and shale and clay

[3] Oil and Gas Journal, v. 62, No. 14, Apr. 6, 1964, pp. 131–132.

(198,422 tons). Smaller quantities of carbon black, iron materials, sludge, air-entraining compounds and grinding aids also were required.

Portland cement shipments were to consumers in 45 States and several foreign countries. Pennsylvania consumed 36 percent of its own production. Shipments to other large consuming States were New Jersey (22 percent), New York (15 percent), Ohio (7 percent), Connecticut (5 percent), and Maryland (4 percent). Masonry cement was shipped to consumers in 24 States and several foreign countries. The State consumed 36 percent of its output and New Jersey received 20 percent; New York, 16 percent; and Ohio, 12 percent.

Distribution of portland cement shipments were to ready-mixed concrete companies (55 percent), concrete product manufacturers (20 percent), building-material dealers (12 percent), highway contractors (9 percent), other contractors (2 percent), and Government and miscellaneous customers (2 percent).

TABLE 5.—Portland cement shipments, by counties

County	Number of plants in 1963	1962		1963	
		376-pound barrels	Value	376-pound barrels	Value
Lehigh	4	6,580,842	$21,041,268	6,566,840	$18,954,773
Northampton	11	19,324,721	63,525,400	18,816,439	56,104,232
Allegheny	2	6,397,052	21,250,020	6,714,204	21,995,863
Lawrence	2				
Berks	1	6,160,200	22,152,731	6,218,726	21,147,992
Butler	1				
Montgomery	1				
York	1				
Total	23	38,462,815	127,969,419	38,316,209	118,202,860

Clays.—Increased production of clay refractories to meet the vigorous demand of the steel industry and generally increased construction activity resulted in an 11 percent increase in clay production following 2 successive years of declining output. Consumption of fire clay, chiefly for firebrick and block, increased 18 percent. Production of miscellaneous clay, chiefly for use in manufacturing heavy clay products, cement, and lightweight aggregate, also increased in 1963. Kaolin output increased 39 percent, chiefly because of greater demand for its use in white cement manufacture. There were 117 clay operations active in 1963, 9 less than in 1962. Of these, 94 were open-pit mines, 19 were underground, and 4 were mills only. Sixty-seven clay mills served these mines. Clearfield County with large production of fire clay was the leading clay-producing area. Leading fire clay-producing counties, valuewise, were Clearfield, Armstrong, and Jefferson. Leading miscellaneous clay-producing counties were Berks, Northumberland, and Dauphin. Kaolin was mined in Cumberland and Blair Counties.

Gem Stones.—Mineral specimens were collected chiefly by hobbyists and amateur lapidarists in the eastern part of the State, particularly the counties of Chester, Lehigh, Monroe, and Montgomery. Specimens included pyromorphite, limonite crystals, zeolites, quartz, calcite, copper and lead minerals, and semiprecious agates.

TABLE 6.—Clays sold or used by producers, by kinds and uses [1]

(Short tons)

Use	Fire clay		Miscellaneous clay	
	1962	1963	1962	1963
Refractories:				
Firebrick and block	611,313	783,272	----------	----------
Fire clay mortar	13,253	20,672	----------	----------
Clay crucibles	2,012	(2)	----------	----------
Foundries and steelworks	57,157	(2)	(2)	(2)
Heavy clay products	516,826	557,945	1,246,641	1,267,538
Portland and other hydraulic cements	----------	----------	(2)	199,275
Undistributed	[3] 75,584	[3] 142,681	[4] 370,676	[4] 219,222
Total	1,276,145	1,504,570	1,617,317	1,686,035

[1] Excludes kaolin.
[2] Included with "Undistributed" to avoid disclosing individual company confidential data.
[3] Includes floor and wall tile (1963), high-alumina brick, glass refractories (1962), other refractories, rubber, paint (1963), insecticides and fungicides, other filler (1963), absorbent uses (1963), other uses (1963), and items indicated by footnote 2.
[4] Art pottery, flowerpots and glaze slip, foundries and steelworks, lightweight aggregate, linoleum and oilcloth, other uses, and items indicated by footnote 2.

TABLE 7.—Clays sold or used by producers in 1963, by counties

County	Short tons	Value	Types of clay
Adams	75,450	$37,950	Miscellaneous clay.
Allegheny	99,452	(1)	Do.
Armstrong	205,562	1,778,368	Fire clay, miscellaneous clay
Beaver	113,828	994,655	Do.
Bucks	56,000	56,000	Miscellaneous clay.
Butler	10,744	16,100	Do.
Chester	98,726	123,500	Do.
Clarion	78,255	334,678	Fire clay, miscellaneous clay.
Clearfield	465,219	3,304,834	Do.
Columbia	12,267	22,080	Miscellaneous clay.
Fayette	101,789	542,315	Fire clay, miscellaneous clay.
Lawrence	430,211	618,102	Do.
Luzerne	30,000	27,000	Miscellaneous clay.
Montgomery	57,682	97,682	Do.
Snyder	5,775	7,219	Do.
Washington	569	569	Fire clay.
Undistributed [2]	1,349,076	6,756,178	
Total [3]	3,190,605	14,717,230	

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes Berks, Blair, Cambria, Centre, Clinton, Cumberland, Dauphin, Huntingdon, Indiana, Jefferson, Lancaster, McKean, Monroe, Northumberland, Schuylkill, Somerset, and York Counties, and counties indicated by footnote 1.
[3] Incomplete total; excludes kaolin produced in Blair and Cumberland Counties.

Graphite.—The natural graphite operation at Chester Springs in Chester County, where crystalline graphite had been recovered from schist, was closed for the 2d successive year. However, manufactured (artificial) graphite powder was produced in Saint Marys by electric graphetizing a carbon product. Sales, chiefly to steel producers, iron and steel foundries, and the electro-chemical industry, were 12 percent greater than those in 1962.

Iron Oxide Pigments.—Sulfur mud from Cambria County and red iron oxide mud residue from past alumina extraction processes in Allegheny County were the only crude iron oxide pigments produced in the State.

Pennsylvania continued as the first ranking State in output of natural and manufactured iron oxide pigments. Output was 7 per-

cent greater than in 1962. Manufactured red iron oxides including the pure calcined copperas were the leading types produced. Manufactured yellow iron oxide (pure), natural brown oxide, burnt umber, manufactured magnetic black (pure), and burnt sienna also had important sales. One producer was active in Carbon County and two plants were operated in Northampton County.

Lime.—Vigorous demand for chemical lime by the steel industry and the pulp and paper industry, and increased refractory lime markets, highlighted a good year for the lime industry as production increased 8 percent. The construction industry consumed slightly more lime, but aglime sales were 5 percent less than in 1962. Sales of hydrated lime were 18 percent less, but the decrease was offset by a 21 percent increase in quicklime sales. Quicklime production comprised 75 percent of output in 1963, an increase from 67 percent in 1962. Average value of lime per ton production decreased $0.31 to $14.77 in 1963. Regenerated lime was one-third less than in 1962. Lime burning capacity of active producers exceeded 1.8 million tons. A variety of kilns were in use, but the bulk of capacity was from 23 rotary kilns which were fired chiefly with bituminous coal.

Fifteen companies, 1 less than in 1962, operated 8 plants in 15 counties. Centre County continued to be the leader, producing 48 percent of the State lime shipments. York, Lebanon, Chester, Butler, and Montgomery Counties were next in decreasing order, each with lime production valued in excess of $1 million. Most of the lime was consumed within the State (59 percent), but large quantities were shipped to Maryland (9 percent), New York (8 percent), New Jersey (7 percent), and Ohio (5 percent).

TABLE 8.—Lime sold by producers, by counties

County	1962		1963	
	Short tons	Value	Short tons	Value
Armstrong	(1)	(1)	327	$4,905
Centre	502,752	$6,732,596	576,346	7,577,065
Dauphin	8,000	128,000	7,500	120,000
Juniata	1,482	15,190	(1)	(1)
Lancaster	841	10,077	(1)	(1)
Lebanon	137,000	1,998,000	150,000	2,182,000
Northumberland	337	3,031	325	2,925
Snyder	1,135	9,202	(1)	(1)
Undistributed [2]	452,009	7,750,806	453,719	7,661,045
Total	1,103,556	16,646,902	1,188,217	17,547,940

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes Bedford, Butler, Chester, Mifflin, Montgomery, Westmoreland (1963), and York Counties, and counties indicated by footnote 1.

Magnesium Compounds.—The magnesium carbonate plant at Plymouth Meeting which used raw dolomite as raw material was closed at the end of 1962. The company reported unprofitable operations.

Mica.—Scrap mica recovered near Glenville in York County was ground and sold chiefly to the paint and rubber industries and for welding rods. Output was slightly higher in 1963.

Perlite (Expanded).—Crude perlite shipped from Colorado was expanded at six plants in Allegheny, Lehigh, Delaware, York, and Mont-

gomery Counties. Production was 14,017 tons, 2 percent less than that of 1962. Average value dropped $5.00 to $60.00 per ton. Sales were mostly to contractors for use as lightweight aggregate in building plaster. Other markets included filler, loose fill insulation, concrete aggregate, insulation, and soil conditioning.

Pyrites.—Pyrite, contained in the iron ores mined in Lebanon and Berks Counties, was separated by flotation in the milling process, concentrated, and shipped to a sulfuric acid plant at the iron and steel complex at Sparrows Point, Md. Consumption of pyrites was less than that in 1962, but because of higher sulfur content of the concentrates, total sulfur consumed was greater in 1963.

Sand and Gravel.—A depressed market for construction sand was the chief factor in a 2-percent drop in overall sand and gravel production. Decreased production of paving and building sand, 10 and 5 percent, respectively, was only partially offset by a 17-percent increase in output of building gravel. Glass sand and ground sand production were at their highest levels since 1946 and 1947, respectively. There were 117 sand and gravel pits active in 45 counties of which 101 had stationary plants, 11 were dredges, 3 had portable plants, and 2 produced only bank-run material. Eighty-five of the pits produced less than 100,000 tons, and only one had production in excess of 1 million tons. Aggregate for use in construction of both private and public buildings was the leading market, consuming 51 percent of total sand and gravel production; paving aggregate consumed 33 percent. Although production of industrial sands (including glass sand) and ground sand comprised only a small fraction of total output, the high prices of these specialty sands brought the value of their production to comprise over one-fifth of total value.

Bucks County, the leading sand and gravel producing area, had a major decrease in production with output 23 percent less than in 1962. Other large producing counties, listed in order of decreasing value of production, were Huntingdon, Armstrong, Erie, Mifflin, and Beaver, each with production valued at over $1 million. Industrial sand production was centered in Huntingdon and Mifflin Counties, but the former county had the entire output of ground sand. Government-and-contractor production was reported in Clearfield and Crawford Counties for paving and road maintenance.

As in 1962, 98 percent of total production was washed, screened, or otherwise prepared. Of total shipments, 67 percent was by truck, 26 percent by waterway, and 7 percent by railroad.

Stone.—Output of stone increased 3 percent but total value of production increased only slightly. This was because the increased output was in lower priced crushed stone chiefly for the aggregate market which was characterized by price cutting in 1963. Dimension stone production decreased 6 percent, but value of production increased 11 percent chiefly because of higher prices for dimension slate and sandstone. Quarries were active in 51 counties, yielding almost 50 million tons. Leading producing counties, valuewise, were Northampton, Montgomery, York, Adams, and Bucks, all with production valued over $5 million.

Limestone was the leading stone comprising 85 percent of total tonnage. Production increased slightly chiefly because of a 5-percent

TABLE 9.—Sand and gravel sold or used by producers, by classes of operations, and uses

(Thousand short tons and thousand dollars)

Class of operation and use	1962		1963	
	Quantity	Value	Quantity	Value
Commercial operations:				
Sand:				
Molding	141	$405	122	$378
Building	4,493	6,511	4,261	6,301
Paving	2,562	3,777	2,298	3,188
Fire or furnace	169	386	168	382
Fill	31	30	39	29
Undistributed [1]	1,529	4,762	1,533	4,914
Total	8,925	15,871	8,421	15,192
Gravel:				
Building	2,510	3,433	2,931	4,313
Paving	2,748	4,070	2,278	3,666
Fill	130	83	153	89
Undistributed [2]	106	130	206	228
Total	5,494	7,716	5,568	8,296
Total sand and gravel	14,419	23,587	13,989	23,488
Government-and-contractor operations:				
Sand: Other			27	33
Gravel: Paving			50	18
Total sand and gravel			77	51
All operations:				
Sand	8,925	15,871	8,448	15,225
Gravel	5,494	7,716	5,618	8,314
Total	14,419	23,587	14,066	23,539

[1] Includes glass, grinding and polishing, blast, engine, filter (1963), railroad ballast (1963), ferrosilicon (1962), ground, and other sand.
[2] Includes railroad ballast, miscellaneous, and other gravel.

increase in output of crushed limestone for concrete aggregate and roadstone. More limestone was needed as flux by the iron and steel industry, but no refractory dolomite was produced in 1963. Output of limestone for cement manufacture dropped 6 percent but increased limestone production for lime, whiting, and dust for coal mines partially offset this loss. Dimension limestone production used solely for rough construction was less than half that of 1962. There were 158 quarries active in 38 counties, the larger of which were in Northampton, Lancaster, York, and Montgomery.

Production of crushed sandstone increased 44 percent, but total value was less that that of 1962 as the average value per ton dropped from $3.16 to $2.17. The reason was sharply increased output for aggregate and decreased production of refractory stone due to the idling of a major quarry in Huntingdon County in 1963. Crushed sandstone was produced at 34 quarries in 21 counties with Westmoreland and Luzerne leading. Value of dimension sandstone production rose 43 percent owing to a large increase in production of flagging and a moderate increase in output of rough construction building stone. Rough architectural stone output decreased slightly. There were 37 sandstone quarries active in 14 counties; Potter and Chester Counties led. Average value per ton of dimension sandstone production increased to $12.66 from $9.91 in 1962.

TABLE 10.—Sand and gravel sold or used by producers, by counties

County	1962		1963	
	Short tons	Value	Short tons	Value
Allegheny	210,362	$370,714	234,248	$398,769
Armstrong	1,208,969	2,492,159	1,416,425	3,102,702
Beaver	(1)	(1)	774,694	1,064,837
Bedford	(1)	(1)	6,748	18,148
Berks	85,544	141,789	58,950	85,762
Bradford	(1)	(1)	112,516	140,000
Butler	135,246	166,110	149,016	202,306
Carbon	217,553	314,953	(1)	(1)
Clearfield			26,858	32,827
Crawford	(1)	(1)	113,734	132,924
Cumberland	222,370	326,490	212,247	309,237
Erie	(1)	(1)	1,400,666	1,988,157
Fayette	162,000	349,000	60,000	131,500
Jefferson	9,000	3,600	(1)	(1)
Lackawanna	186,348	189,851	233,802	236,697
Lancaster	206,016	360,020	204,595	383,655
Luzerne	433,309	522,928	464,859	547,970
McKean	(1)	(1)	10,000	10,000
Mercer	222,887	293,684	322,557	448,827
Monroe	77,688	84,980	(1)	(1)
Montgomery	(1)	(1)	590	13,676
Northampton	461,270	550,396	448,603	550,860
Schuylkill	91,482	220,719	121,803	257,964
Snyder	(1)	(1)	128,325	134,058
Somerset	850	2,680	(1)	(1)
Warren	156,091	226,253	209,892	318,767
Wayne	(1)	(1)	16,639	23,030
Undistributed [2]	10,331,537	16,970,309	7,338,050	13,006,508
Total	14,418,522	23,586,635	14,065,816	23,539,181

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes Blair, Bucks, Cambria, Clarion, Columbia, Dauphin, Elk, Forest, Franklin, Fulton, Huntingdon, Lawrence, Lehigh (1962), Lycoming, Mifflin, Montour, Philadelphia, Venango, Wyoming, and York Counties, and counties indicated by footnote 1.

Increased production of higher-priced structural and sanitary slate for blackboards and roofing, resulted in slightly increased value of dimension slate production even though slate output dropped 8 percent in 1963. Crushed slate production, which increased 12 percent, also had increased prices. Production was chiefly from Northampton County.

Production of crushed basalt was less as its major market (aggregate) was depressed. Other stone aggregates and gravel presented stiff competition. Basalt production for railroad ballast also decreased in 1963. Twenty-two quarries were active in seven counties, of which Delaware and Adams were the leading.

Crushed miscellaneous stone production which was used entirely as concrete aggregate and roadstone increased 9 percent. Production which was centered in Montgomery and Bucks Counties consisted entirely of argillite. A small quantity of mica schist dimension stone also was produced.

Crushed granite production which was used entirely for aggregate was produced at a rate 22 percent higher than in 1962. Quarries were located in Bucks and Montgomery Counties. Small quantities of dimension granite were produced in Bucks and Montgomery Counties for rough and dressed construction uses. Oystershell was produced for poultry grit in Berks County.

Roofing granules production dropped in 1963 because of reduced sales of artificially colored granules. Of total production, 81 percent

was artificially colored; the balance was natural material. Three plants were active, one each in Adams, York, and Beaver Counties. Slate, basalt, and clay were the raw materials used in roofing granules production.

TABLE 11.—Stone sold or used by producers, by uses

Use	1962		1963	
	Short tons	Value	Short tons	Value
Dimension stone:				
Building stone	146,721	$1,232,061	132,623	$1,324,393
Curbing and flagging	[1] 36,864	[1] 739,879	38,604	884,090
Other uses	[1] 28,581	[1] 3,232,982	29,152	3,548,153
Total	212,166	5,204,922	200,379	5,756,636
Crushed and broken stone:				
Concrete and roadstone	26,471,466	39,184,889	28,425,086	41,027,731
Furnace flux (limestone)	4,566,923	8,448,314	4,788,866	8,791,840
Railroad ballast	603,870	938,465	483,395	733,264
Refractory	[2]	[2]	131,214	1,445,489
Agricultural	1,075,943	3,306,754	1,089,748	3,255,974
Other uses [3]	15,213,556	25,003,504	14,417,088	22,439,139
Total	47,931,758	76,881,926	49,335,397	77,693,437
Grand total	48,143,924	82,086,848	49,535,776	83,450,073

[1] Revised figure.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Includes refractory (1962), and riprap.

TABLE 12.—Stone sold or used by producers, by counties

County	1962		1963	
	Short tons	Value	Short tons	Value
Adams, Cumberland, York	6,105,873	$12,622,809	6,800,782	$13,721,004
Berks	3,200,677	4,823,352	3,192,310	4,083,477
Blair, Huntingdon	1,355,747	3,496,433	1,383,193	2,373,561
Bucks	1,671,151	3,055,563	2,859,489	5,117,736
Butler	1,185,839	2,325,491	1,082,807	2,087,679
Cambria	5,000	15,000	2,700	8,100
Carbon, Monroe, Schuylkill	897,183	2,207,521	708,597	1,854,051
Centre	2,027,577	4,124,154	2,068,603	3,770,312
Chester	2,559,595	4,246,967	2,133,717	3,888,616
Dauphin	1,102,812	1,770,328	1,026,014	1,499,608
Erie			140	225
Fayette, Somerset	1,495,280	2,866,745	1,529,179	2,937,153
Franklin	782,139	1,212,870	1,042,780	1,360,517
Juniata, Mifflin, Snyder	724,316	1,256,552	691,999	1,102,674
Lackawanna	[1]	[1]	136,986	272,114
Lancaster	3,121,121	4,687,386	3,094,198	4,380,148
Lawrence	2,519,025	4,030,229	2,601,792	4,348,166
Lebanon	1,358,550	2,362,526	1,436,793	2,444,595
Lehigh, Northampton	7,956,320	10,069,009	7,183,314	10,550,034
Luzerne	327,516	533,601	[1]	[1]
Montgomery	4,172,474	6,812,006	4,189,420	6,694,731
Northumberland	48,538	85,916	56,150	99,600
Potter	7,160	205,132	8,702	254,751
Wayne	[1]	[1]	117,607	185,807
Westmoreland	651,592	1,101,029	741,910	1,289,389
Undistributed [2]	4,868,439	8,176,229	5,446,594	9,126,025
Total	48,143,924	82,086,848	49,535,776	83,450,073

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes Allegheny, Armstrong, Bedford, Clarion, Clinton, Delaware, Fulton, Jefferson (1963), Lycoming, Mercer, Montour, Perry, Susquehanna, Tioga, Union, Washington, and Wyoming Counties, and counties indicated by footnote 1.

Sulfur.—Production of brimstone, recovered in the liquid purification of refinery gases in Delaware and Philadelphia Counties decreased in 1963. Hydrogen sulfide, recovered at a refinery in Philadelphia County, was used in manufacturing sulfuric acid. Processes used were the Claus, single stage catalytic oxidation of hydrogen sulfide, and the Girdler system. Sulfuric acid was recovered as a byproduct at zinc smelters and roasters.

Talc.—Production of sericite schist from three open-pit mines in Adams County decreased in 1963. The asphalt filler and insecticide markets were depressed, but the roofing market consumed five times more ground sericite schist than in 1962. Consumption for joint cement also increased in 1963.

Tripoli.—Sales of tripoli chiefly to the abrasives industry (buffing compound) were about one-fourth greater than in 1962. Production was reported from two quarries in Lycoming County.

Vermiculite (Exfoliated).—There was an excellent market for exfoliated vermiculite in the State in 1963 as sales increased significantly over 1962. Crude vermiculite from Montana, South Carolina, and a smaller quantity from Southern Rhodesia, was processed and sold for a variety of uses, chiefly for plaster aggregate, insulation, concrete aggregate, and insulation cement.

METALS

Beryllium.—The Beryllium Corp. with operations at Reading and Hazleton processed beryl to beryllium metal, alloys and compounds.

Cadmium.—Cadmium was recovered from flue dusts collected at the zinc smelters of St. Joseph Lead Co. at Josephtown and the New Jersey Zinc Co. at Palmerton.

Cobalt.—Production of cobalt, leached from the iron cinders of roasted pyrites, which had been recovered as a byproduct in iron ore mining, increased sharply in 1963.

Columbium.—A new columbium processing facility capable of processing almost any columbium ore or concentrate was put on stream in October by Kawecki Chemical Co. at Boyerstown.

Copper.—Copper concentrates were recovered as a byproduct of processing iron ore at an operation in Lebanon County. Output was significantly greater than in 1962.

Ferroalloys.—Shipments of ferroalloys increased over 50,000 tons to total 509,000 tons valued at $91.2 million. Ferromanganese shipments comprised 91 percent and spiegeleisen 8 percent of total shipments. Other shipments included ferromolybdenum, ferrotungsten, and ferrocolumbium.

Gold and Silver.—Sharply increased recovery of gold and silver was reported from the copper concentrates recovered in milling iron ore in Lebanon County.

Iron Ore.—Increased production of magnetite was reported from the Cornwall and Grace iron ore mines at Cornwall and Morgantown, respectively. Concentrates were prepared by magnetic separation at processing plants located at the mine sites. Most of the concentrates were processed into pellets by agglomeration at the processing plants. Shipments of pellets remained at a high rate.

Iron and Steel.—The upturn in the economy was reflected in the 10-percent increase in production of both pig iron and steel in Pennsylvania. The State continued to rank first in the Nation in iron and steel production. Output of pig iron was 17.3 million tons and according to the American Iron and Steel Institute, 25.2 million tons of steel was produced. Steel production was 84 percent from open-hearth furnaces; most of the balance was from electric furnaces, plus smaller quantities from Bessemer converters and from new oxygen-lance furnaces. Of the pig iron production, 89 percent was classed as basic. In order of production, other classes were Bessemer, malleable, foundry, and low phosphorous. A small tonnage was made directly into castings.

Receipts of U.S. produced iron ore decreased 9 percent, but foreign ore receipts increased slightly. To meet the increased demand, iron ore stocks were depleted to the extent of 1.7 million tons. At yearend stocks were 14 percent less than 1962. Of the total iron ore consumed, 55 percent was prepared by agglomeration and 45 percent was consumed directly in blast or steel furnaces. Fluxes consumed by the iron and steel industry included 3.2 million tons of limestone and 2.1 million tons of dolomite. Other materials consumed were 1.2 million tons of mill cinder and roll scale, 0.9 million tons of raw flue dust, 1.5 million tons of steel furnace slag, 11.9 million tons of coke and coke breeze, 240,000 tons of anthracite, 15.3 million tons of pig iron and hot metal, and 9.7 million tons of scrap.

Agglomerate consumption in iron and steel furnaces was 18.7 million tons of which two-thirds was U.S. sinter (regular), and one-fifth was pellets. The balance of the agglomerates consumed were semi- and-self-fluxing sinter and pellets, and foreign agglomerates. In the operation of the iron and steel furnaces, 5.9 million tons of slag was produced, 700,000 tons of flue dust was recovered, and 120,000 tons of scrap was produced.

Ten companies operated 21 plants in the State, a reduction of 1 company and plant from that of 1962. Sixty-four blast furnace stacks were active, a reduction of three from that of 1962.

The new basic oxygen steelmaking technique gained impetus in the State as both Allegheny Ludlum Steel Corp. and Pittsburgh Steel Co. announced construction plans to install oxygen furnaces. A new vacuum melting process, featuring hot metal charging into a 60,000-pound vacuum induction furnace, was being installed by Latrobe Steel Co.

Iron and Steel Scrap.—Increased markets for steel brought about consumption of larger quantities of iron and scrap by the steel industry. The larger metropolitan areas such as Pittsburgh, Philadelphia, and Harrisburg led in collection of scrap. The leading varieties shipped were No. 1 heavy melting steel, No. 2 and all other bundles, cast-iron scrap and other borings, and No. 1 and electric furnace bundles.

Slag (Iron-Blast-Furnace).—Although production of iron-blast-furnace slag decreased from 6.2 million tons in 1962 to 5.9 million tons in 1963, Pennsylvania continued to rank first in output of this processed commodity with 25 percent of the National production. Average value increased slightly to $1.80 per ton. As in past years, chief markets were aggregate use in highway and airport construc-

tion, bituminous construction, portland-cement construction, and for railroad ballast.

Smelters.—Two zinc smelters were active in 1963. The Palmerton plant of the New Jersey Zinc Co. processed concentrates from the company operations at Jefferson City, Tenn., Friedensville, Pa., Austinville, Va., Canon City, Colo., and crude ore from Sterling Hill, N.J. Other domestic and some foreign concentrates also were processed. Zinc metal was produced but no lead concentrates were processed in 1963, being shipped to outside smelters. A byproduct sulfuric acid plant, a cadmium recovery unit, and a new anhydrous ammonia plant were part of the Palmerton complex. The Josephtown plant of St. Joseph Lead Co. smelted zinc concentrates from its New York and Missouri operations, plus other domestic and foreign concentrates. Zinc oxide, zinc metal, cadmium, and sulfuric acid were produced at the Josephtown plant.

Zinc.—Sphalerite produced at the Friedensville mine of the New Jersey Zinc Co. was concentrated at the mine and shipped to the company smelter at Palmerton. Mine output increased substantially over that of 1962 to meet the increased demand for zinc metal in 1963.

REVIEW BY COUNTIES

Adams.—Total stone output was 10 percent more than that of 1962. Limestone, chiefly for use as flux in iron and steel plants, concrete aggregate, roadstone, and stone sand, was mined and crushed at a plant west of Hanover, by Bethlehem Limestone Co., a subsidiary of Bethlehem Steel Co., Teeter Stone, Inc., a subsidiary of Harry T. Campbell Sons Corp., Gettysburg, and Gettysburg Limestone Products, Inc., Fairfield, quarried and crushed limestone chiefly for concrete aggregate and roadstone. The Ruberoid Co., Roofing Granule Division, crushed and ground stone at its Graystone quarry (quartzite) and the Green Spoils Dump (basalt) east of Charmian. The stone was crushed and ground for use as roofing granules, tennis court surfacing, stone dust, and asphalt filler.

Mauna Mining Corp. produced sericite schist at an open-pit mine near Gardner. The crude material was trucked to a mill at Carlisle (Cumberland County) and ground for use as a filler in asphaltic compounds and roofing. Summit Industries, Inc., operated two open-pit mines near Mount Hope and Bendersville. The crude material was trucked to the company plant at Aspers to be crushed, screened, and ground, chiefly for use as asphalt filler and for joint cement.

Shale, chiefly for building brick, was mined by Alwine Brick Co., New Oxford, and Gettysburg Drain Tile Works, Gettysburg, at virtually the same rate as in 1962.

Allegheny.—Bituminous coal production decreased 8 percent. Of total production, 76 percent was mined at 20 underground mines, the balance at 18 strip and 2 auger mines. Almost 100 percent of the underground production was mechanically loaded by 25 mobile loaders, and 17 continuous miners. There was a decrease of 12 mobile loaders and 12 continuous miners from the number in 1962. Equipment at strip mines included 34 power shovels, 6 draglines and 15 bulldozers. Five cleaning plants cleaned 75 percent of total output. One of the larger cleaning plants used three thermal drying units.

TABLE 13.—Value of mineral production in Pennsylvania by counties[1 2]

County	1962	1963	Minerals produced in 1963 in order of value
Adams	(3)	(3)	Stone, sericite schist, clays.
Allegheny	(3)	$35,348,049	Coal, cement, clays, sand and gravel, stone, iron ore (pigment material).
Armstrong	(3)	(3)	Coal, sand and gravel, clays, stone, lime.
Beaver	$3,866,842	3,535,030	Coal, sand and gravel, clays.
Bedford	2,288,829	(3)	Stone, coal, lime, sand and gravel.
Berks	34,655,423	32,397,801	Iron ore, cement, stone, clays, cobalt, coal, pyrites, sand and gravel.
Blair	2,160,807	1,903,668	Stone, clays, coal, sand and gravel.
Bradford	(3)	(3)	Sand and gravel, coal.
Bucks	(3)	(3)	Stone, sand and gravel, clays.
Butler	16,034,719	14,486,841	Coal, cement, stone, lime, sand and gravel, clays.
Cambria	34,419,060	37,754,195	Coal, clays, sand and gravel, stone, iron ore (pigment material).
Cameron	(3)	264,698	Coal.
Carbon	(3)	6,774,955	Coal, stone, sand and gravel.
Centre	(3)	(3)	Lime, stone, coal, clays.
Chester	(3)	(3)	Stone, lime, clays, gem stones.
Clarion	13,627,949	13,844,560	Coal, stone, clays, sand and gravel.
Clearfield	27,139,085	28,418,087	Coal, clays, sand and gravel.
Clinton	1,812,797	1,871,537	Coal, stone, clays.
Columbia	(3)	3,269,045	Coal, sand and gravel, clays, peat.
Crawford	(3)	132,924	Sand and gravel.
Cumberland	(3)	(3)	Stone, sand and gravel, clays.
Dauphin	3,329,923	3,559,293	Stone, coal, clays, sand and gravel, lime.
Delaware	(3)	(3)	Stone.
Elk	1,783,675	(3)	Coal, sand and gravel.
Erie	(3)	(3)	Sand and gravel, peat, stone.
Fayette	(3)	(3)	Coal, stone, clays, sand and gravel.
Forest	(3)	(3)	Sand and gravel.
Franklin	(3)	(3)	Stone, sand and gravel.
Fulton	(3)	(3)	Stone, sand and gravel.
Greene	(3)	59,373,257	Coal.
Huntingdon	(3)	(3)	Sand and gravel, stone, coal, clays.
Indiana	(3)	(3)	Coal, clays.
Jefferson	(3)	(3)	Coal, clays, stone, sand and gravel.
Juniata	(3)	(3)	Stone, lime.
Lackawanna	(3)	10,272,932	Coal, stone, sand and gravel.
Lancaster	(3)	(3)	Stone, coal, sand and gravel, clays, lime.
Lawrence	(3)	(3)	Cement, stone, coal, clays, sand and gravel, peat.
Lebanon	(3)	(3)	Iron ore, copper, stone, lime, coal, cobalt, gold, pyrites, silver.
Lehigh	(3)	(3)	Cement, zinc, stone, gem stones.
Luzerne	(3)	(3)	Coal, stone, sand and gravel, peat, clays.
Lycoming	1,530,655	1,519,666	Stone, sand and gravel, coal, tripoli.
McKean	211,590	(3)	Clays, coal, sand and gravel.
Mercer	(3)	(3)	Coal, sand and gravel, stone.
Mifflin	1,989,202	1,979,023	Sand and gravel, stone, lime.
Monroe	1,049,520	562,571	Stone, sand and gravel, clays, gem stones.
Montgomery	13,655,719	13,097,487	Stone, cement, lime, clays, sand and gravel, gem stones.
Montour	(3)	(3)	Stone, sand and gravel.
Northampton	73,728,150	66,800,123	Cement, stone, sand and gravel.
Northumberland	12,941,584	(3)	Coal, clays, stone, lime.
Perry	(3)	(3)	Stone.
Philadelphia	(3)	(3)	Sand and gravel.
Potter	205,132	254,751	Stone.
Schuylkill	50,085,171	(3)	Coal, stone, sand and gravel, clays.
Snyder	430,511	424,159	Stone, sand and gravel, coal, clays, lime.
Somerset	10,657,312	13,333,376	Coal, clays, stone, sand and gravel.
Sullivan	63,122	66,717	Coal.
Susquehanna	(3)	(3)	Stone.
Tioga	(3)	(3)	Coal, stone.
Union	(3)	(3)	Stone.
Venango	(3)	(3)	Coal, sand and gravel.
Warren	226,253	318,767	Sand and gravel.
Washington	(3)	(3)	Coal, stone, clays.
Wayne	474,698	(3)	Stone, peat, coal, sand and gravel.
Westmoreland	20,072,149	(3)	Coal, stone, lime.
Wyoming	(3)	(3)	Sand and gravel, stone.
York	16,764,312	17,146,330	Cement, stone, lime, clays, sand and gravel mica.
Undistributed	[4] 478,299,683	488,154,601	
Total	[4] 823,504,000	856,864,000	

[1] Pike County is not listed because no production was reported.
[2] Excludes value of production for LP gases, natural gasoline, petroleum, natural gas, and some gem stone unspecified by counties; included with "Undistributed."
[3] Included with "Undistributed" to avoid disclosing individual company confidential data.
[4] Revised figure.

Production of portland cement increased in 1963. Two plants were in operation, one operated by Universal Atlas Cement Division of United States Steel Corp., Universal; and one by Green Bay Cement Co., Neville Island. The former company operated a two-kiln dry process plant, the latter a three-kiln wet process plant. The latter company installed a new kiln, 500 feet in length, in 1963, sharply increasing its capacity. Portland slag and general use types were the leading cements produced. Output was consumed mostly in Western Pennsylvania. Ready-mixed concrete companies and cement-product manufacturers were the leading consumers.

Sand and gravel production increased 11 percent from that of 1962, mainly because of increased production of gravel for use as building aggregate. About 65 percent of the total output reached consumers as processed material. Output was reported by four producers with plants located at Harmarville, Natrona Heights, and Pittsburgh. Harry Zubik Co., Inc., recovered material from river deposits with a floating dredge.

Miscellaneous clay production, which was entirely for building brick manufacture, increased 15 percent in 1963. Five producers were active, the larger of which were Milliken Brick Co., Inc., Wilkinsburg, and Suburban Supply Co., Murraysville.

Dimension sandstone for rubble and rough construction was produced at Elizabeth and Finleyville.

Pennsalt Chemicals Corp. produced red iron oxide pigments from the red mud residue from a former aluminum reduction plant at Natrona. Perlite, shipped from mines in Colorado, was expanded by Panacalite Perlite Co., Pittsburgh, and Perlite Manufacturing Co., Carnegie. The material was used mainly for loose fill insulation, building plaster, and concrete aggregate.

Armstrong.—Bituminous coal production increased 18 percent. Of total output, 61 percent was mined at 44 underground mines, 36 percent at 45 strip mines, and 3 percent at 13 auger mines. Of the underground production 94 percent was mechanically loaded by 30 mobile loaders, 4 continuous miners, and 20 face conveyors. Eight cleaning plants cleaned 48 percent of total output. One plant had thermal drying equipment. Equipment at strip mines included 76 power shovels, 22 draglines, 62 bulldozers, and 7 carryall scrapers.

Tonnage and value of sand and gravel production increased 17 and 24 percent, respectively. The county ranked second in production and third in value in the State. Increased demand for construction sand and gravel was the principal reason for the increased output. Davison Sand & Gravel Co., the principal producer, recovered material from the Allegheny River near Clinton using a marine dredge. When necessary, additional processing was done at the company's New Kensington plant. Glacial Sand & Gravel Co. (Tarrtown) and Manorville Sand Co. (Manorville) processed sand and gravel. John Cihat and Universal Sand and Loam Co. produced sand from pits near Leechburg for industrial and construction use, respectively.

Production of clay remained at virtually the same rate as in 1962. Output was chiefly fire clay for manufacturing firebrick and block, vitrified sewer pipe, and other heavy clay products. Eight producers were active with output centered in the Kittanning area. The lead-

ing producer was the Freeport Brick Co., Freeport. The plant of Continental Clay Products Co. at Kittanning was idled by a strike from June 19 to December 18, 1963. Kittanning Brick Co. reported the installation of a mechanical loading machine at its underground mine at Adrian.

Mowrey & Good (a new producer) produced and crushed limestone for agstone at quarries near Girty and McWilliams. Beaver Run Limestone Co., Apollo, produced crushed limestone for concrete aggregate and roadstone. C. D. McCanna, Kittanning, produced crushed limestone for use in making hydrated aglime. Robert E. Toy, Kittanning, discontinued his limestone and lime operations during the year.

Beaver.—Coal production decreased 29 percent from that of 1962. Of total production, 77 percent was mined at 13 strip mines, the balance at 1 underground and 5 auger mines. Equipment at strip mines included 18 power shovels, 11 draglines, and 20 bulldozers.

Increased demand for sand and gravel for building and paving aggregate was reported by four producers. Iron City Sand & Gravel Corp., Division of McDonough Co., operated a dredge on the Ohio River. Shippingport Sand & Gravel Co. produced sand and gravel at Shippingport and Georgetown. Darlington Ready Mix Co. recovered sand and gravel from a pit at Darlington. Ellwood Stone Co. processed sand for industrial use from a pit near Ellwood City.

Fire clay production remained stable but miscellaneous clay output increased sharply. Production was centered in the north-central part of the county near New Brighton and Darlington. Output was mostly fire clay for building brick manufacture. Some clay also was used in firebrick and vitrified sewer pipe manufacture. The leading producers were Standard Clay Manufacturing Co., New Brighton; Colonial Clay Products Co., Fallston; and Eastvale Clay Products Co., Beaver Falls. Colonial Clay Products Co. reported completion of a modernization program. Darlington Brick Division, General Dynamics Corp., purchased Central Commercial Company's roofing granule plant at Darlington at midyear. Both companies produced artificially colored granules in 1963.

Bedford.—Increased production of sandstone raised total stone output 67 percent over that of 1962. Leap Ganister Rock Co., Hyndman, crushed ganister rock from stockpile for use as furnace or converter linings. Detwilers Industries, Inc., Weyant, quarried and crushed sandstone for concrete aggregate and roadstone. Output was from the Chemung sandstone conglomerate, which contains about 50 percent sand and meets a need for sand in the county and surrounding area. Limestone was quarried near Everett and New Paris for use as concrete aggregate, roadstone, dust for coal mines, and for lime manufacture.

Bituminous coal production decreased by 10 percent. Three less underground mines (11) were active but one additional strip mine (3) was put into operation. Most of the underground production was mechanically loaded by a continuous mining machine. Equipment at strip mines included four power shovels, two draglines, and three bulldozers.

Feight Bros. recovered sand from a pit near Everett for use as building material. New Enterprise Stone & Lime Co. produced hydrated aglime at its Ashcom plant. J. Mason Kerr's lime plant was permanently abandoned.

Berks.—Bethlehem Cornwall Corp. mined crude magnetite, containing recoverable pyrite, copper, gold and silver, and cobalt at Morgantown. A concentrator at the mine processed the ore by crushing and grinding, magnetic separation, and flotation to produce iron ore pellets and pyrite and copper concentrates.

Reduced production of portland and masonry cement was reported by Allentown Portland Cement Co. at its Allentown plant. The company mined the limestone and cement rock used in the manufacturing process. Output which was entirely general use and moderate heat and high-early-strength types, both air-entrained and non-air-entrained, was shipped mainly in bulk by truck and railroad to consumers in Eastern Pennsylvania, New Jersey, New York, and Connecticut. Ready-mixed concrete companies were the leading consumers.

Production of stone decreased 15 percent in 1963. Four companies quarried and crushed limestone at six operations. The stone was chiefly for concrete aggregate, roadstone, and for the manufacture of cement. In addition to output by Allentown Portland Cement Co., Eastern Lime Corp. operated quarries at Oley and Kutztown, Berks Products Corp. quarried at Temple and E. J. Breneman, Inc., produced near Sinking Spring. Reading Poultry Food Co., Reading, crushed oystershell for use as poultry grit and mineral food. Martin Quarries quarried crushed sandstone near Bechtelsville for use as aggregate. Crushed basalt production decreased 17 percent in 1963 as the aggregate and railroad ballast markets were depressed. Producers were The John T. Dyer Quarry Co., Birdsboro, Bradford Hills Quarry, Inc. (processing waste rock from the Grace iron ore mine at Morgantown), and Pottstown Trap-Rock Quarries, Inc., Douglassville. The latter company installed a new crusher and screening plant in 1963.

Increased output of miscellaneous clay for building brick was reported by Glen-Gery Shale Brick Corp. from pits near Wyomissing and Shoemakersville.

Anthracite was mined at a rate slightly less than that of 1962.

Sand and gravel production decreased significantly. Refractory Sand Co., Inc., the leading producer, recovered fire and furnace sand at its Grings Quarry, Sinking Spring, and Schildt Bros., Temple, also produced sand and gravel mostly for building and paving aggregate.

Blair.—Crushed limestone was produced by eight companies operating nine quarries near Hollidaysburg (3), Claysburg, Altoona, Royer, Tyrone, Duncansville, and Roaring Spring. Output was sold or used chiefly for roadstone with smaller quantities for agstone and asphalt filler. The leading producer was New Enterprise Stone & Lime Co. General Refractories Co. (Hollidaysburg) and J. L. Hartman (Sproul) produced crushed sandstone for ganister. C. E. Powell took over operation from Basalt Traprock Co. and produced crushed sandstone chiefly for aggregate but also for riprap and railroad ballast.

Near Williamsburg, Harbison-Walker Refractories Co. mined fire clay and Grannas Brothers mined kaolin for use in firebrick manufacture.

Only a small production of bituminous coal was reported in 1963. There was a sharp reduction in strip-mined tonnage.

Output from two sand and gravel deposits near Hollidaysburg remained virtually the same as in 1962. All of the sand was processed and used primarily as building aggregate.

West Virginia Pulp & Paper Co. regenerated lime at its pulp and paper plants in Tyrone and Williamsburg for reuse in its manufacturing process.

Bradford.—Output of sand and gravel increased from that of 1962. Towanda Sand & Gravel Co., Inc., and J. A. Eck & Sons, Inc., supplied the State highway department with large quantities of road base and antiskid material. Additional quantities of sand and gravel were processed for use as building aggregate and fill.

Bituminous coal was produced at one strip operation.

Bucks.—Five quarries near Rushland, Eureka, Trevose, New Hope, and Buckingham produced limestone solely for use as concrete aggregate and roadstone. The leading limestone producers were Eureka Stone Quarry, Inc., Eureka, and New Hope Crushed Stone & Lime Co., New Hope. Some dimesion limestone for use as rough construction stone was quarried near Trevose. Dimension sandstone for rough construction was quarried by Delaware Quarries at Lumberville. Crushed sandstone was produced by George Wiley at Point Pleasant for concrete aggregate and roadstone. Samuel M. Yoder Estate quarry was sold in 1963 and did not operate. Crushed granite for concrete aggregate and roadstone was produced by Vernon Horn near Chalfont. The company reported the installation of a new primary crusher in 1963. Crushed basalt production for use as aggregate increased over half that of 1962. Five producers were in operation, the larger of which were General Crushed Stone Co., Quakertown, and Tohickon Stone Quarry, Weisel. Two producers quarried dimension basalt; sales were mostly for dressed monumental uses. Tohickon Stone Quarry added an additional secondary crusher and expanded the screening and storage area.

Despite a production decline of 23 percent, the county remained the leading area for sand and gravel production. The Warner Co.'s Van Sciver plant, the leading producer, was also the largest sand and gravel producer in the State. Output was reported by six other companies, the larger of which were Durnan and Good, and Frank Casilio & Sons, Inc., both at Upper Black Eddy, Penn Valley Crushed Stone Co., Levittown, and Silvi Concrete Products, Tullytown.

Miscellaneous clay was mined by Quakertown Brick & Tile Co. near Quaktertown for building brick manufacture.

Vermiculite imported from Southern Rhodesia was processed by Hyser & Lewellen at Southampton. The material was for use primarily as insulation in residential projects and as concrete aggregate.

Butler.—Coal production decreased 15 percent from that of 1962 and 84 percent was mined at 30 strip mines, 8 percent each at 19 under- 84 percent was mined at 30 strip mines, 8 percent each at 19 underground and 9 auger mines. Of the underground production two-

thirds was mechanically loaded chiefly by mobile loading machines. Four cleaning plants were active preparing 23 percent of total output. Equipment at strip mines included 44 power shovels, 29 draglines, and 48 bulldozers.

Penn-Dixie Cement Corp. produced both portland and masonry cement at its two-kiln wet process plant at West Winfield. Shipments were mostly general use and moderate heat types of portland cement by truck in bulk to ready mixed concrete companies in western Pennsylvania.

Limestone production decreased slightly. Five companies operated quarries, the leading of which were Penn Dixie Cement Co., West Winfield; Sechan Limestone Co., Prospect; and Alleghany Mineral Corp., Harrisville. The crushed limestone was used for concrete aggregate, roadstone, cement manufacture, flux in iron and steel plants, and agstone. Grove City Limestone Co., Branchton, enlarged its crushing facilities.

Output of sand and gravel increased 10 percent, chiefly because of increased demand for building sand and gravel. Principal producers were Highway Sand & Gravel Co., Inc., and H. W. Cooper, both of Slippery Rock. Penn-Dixie Cement Corp. produced sand and limestone for its use in the manufacture of cement. Mercer Lime & Stone Co. produced both quicklime and hydrated lime at Branchton for aglime and for consumption in steel furnaces.

Scott Borland Brick Yard mined miscellaneous clay at Mars and produced building brick.

Cambria.—Coal production increased 18 percent and the number of active mines increased by 8 to 121. Of total production, 88 percent was mined at 101 underground mines and 12 percent at 18 strip and 2 auger mines. Almost 97 percent of the underground production was mechanically loaded by 18 mobile loaders, 86 continuous miners, and 30 face conveyors. The county led in number of operating continuous mining machines. Equipment at strip mines included 39 power shovels, 13 draglines, and 27 bulldozers. Nine cleaning plants prepared 76 percent of total output.

A slight increase was recorded in clay production. Miscellaneous clay production was entirely for building brick manufacture and fire clay output was mostly for manufacturing vitrified sewer pipe. The leading producer was the Triangle Clay Products Co., Johnstown.

Parry Sand & Gravel Co., Johnstown, produced sand and gravel for construction. Crushed sandstone for silica brick and for aggregate was produced by Samuel Nicosia near Johnstown. Lanzendorfer Minerals Co. produced sulfur mud for iron oxide pigments at its No. 31 mine near Nanty Glo.

Cameron.—Coal production from one strip operation was cleaned at a heavy media preparation plant.

Carbon.—Anthracite production decreased 4 percent to 645,000 tons even though the number of men employed rose by 37 to 343. The leading anthracite producers were Lehigh Valley Anthracite, Inc., and Greenwood Stripping Corp.

Refractory sandstone (ganister) was produced by North American Refractories at Palmerton. Fauzio Bros. produced crushed sandstone aggregate near Nesquehoning. Alliance Sand Co. (Palmerton),

the principal producer, processed sand for building and paving and for use in manufacturing cement.

Centre.—The county was the leading lime producing area. Quicklime and hydrated lime was produced by three companies at a greater rate than in 1962 for sale chiefly to the steel and paper industries. They were National Gypsum Co. and The Warner Co., both at Bellefonte, and Standard Lime & Cement Co. at Pleasant Gap. These companies were also the leading producers of limestone. Most of the lime output was consumed within the State, but significant quantities were shipped to Maryland, New York, and Ohio.

Limestone production increased slightly over that of 1962. The principal uses of the limestone were for lime manufacture, concrete aggregate, roadstone, glassmaking, flux in iron and steel plants, and agstone. Six companies produced crushed and broken limestone from quarries near Bellefonte (2), Pleasant Gap (2), State College, and Marion Township. In addition to the lime-producing companies, Fry Coal & Stone Co. and Neidigh Brothers Limestone Co., Inc., quarried significant quantities of limestone. Warner Co. made improvements at its Bellefonte operation by installing new shovels in the quarry and renovating its processing plant.

Coal production increased 4 percent. Of total production, 94 percent was mined at 13 strip mines, 5 percent at 11 underground mines, the balance at 1 auger mine. Of the underground production 44 percent was hand-loaded onto face conveyors. Two cleaning plants, one of which had thermal drying equipment, cleaned 59 percent of total production. Equipment at strip mines included 32 power shovels, 14 draglines, and 20 bulldozers.

Fire clay was mined by Harbison-Walker Refractories Co. at its Blair mine near Stormstown for firebrick manufacture.

Chester.—Quantity and value of stone output decreased 17 and 8 percent, respectively, but output continued to exceed 2 million tons. The Warner Co. produced limestone at its Johnson quarry and Paoli plant for use as concrete aggregate and roadstone. The company's Cedar Hollow plant at Devault produced crushed limestone chiefly for blast-furnace and open-hearth flux, lime manufacture, and dolomite for magnesium plants. Fry Coal & Stone Co., Division of Martin-Marietta Corp., purchased the Valley Forge Stone Co. plant near Malvern and quarried limestone for concrete aggregate, roadstone, and riprap. Bradford Hills Quarry, Inc., Downingtown, produced limestone for concrete aggregate and roadstone. Four producers quarried dimension sandstone chiefly for rough construction. The leading were Frank Rarick at Malvern and Abram T. Minor at Avondale. A significant decrease in production of crushed basalt was recorded reflecting a lull in roadbuilding activity in 1963. V. Di Francesco & Sons, Devault, and Keystone Trappe Rock Co., Glenmoore, produced crushed basalt, and French Creek Granite Co., Inc., quarried dimension basalt near St. Peters chiefly for dressed architectural uses.

Quicklime and hydrated lime was produced by The Warner Co. near Devault for sale as Mason's lime, aglime, and lime for sewage treatment and acid neutralization to consumers chiefly in Pennsylvania and New Jersey.

McAvoy Vitrified Brick Co. mined miscellaneous clay at Phoenixville for use in manufacturing building brick. Mineral specimens including wolframite, zoisite and pyrrhotite in quartz, and limonite cube crystals were collected near Cornog, Phoenixville, and Williams Corners.

Clarion.—Coal production increased 6 percent, but the number of active mines decreased by 8 to 40. Of total production, 96 percent was mined at 32 strip mines, 3 percent at 5 underground mines, and 1 percent at 3 auger mines. The county was second ranked in strip tonnage. Most of the underground production was mechanically loaded by one mobile loader and two continuous miners. Equipment at strip mines included 84 power shovels, 46 draglines, and 63 bulldozers. Six cleaning plants were active preparing 59 percent of total output. One plant had thermal drying equipment.

Limestone for use as concrete, roadstone, and agstone, was produced by Allegheny Mineral Corp. at a quarry and plant east of Parker. Emlenton Limestone Co., Inc., produced limestone near Turkey City for roadstone.

Total clay production was slightly less than in 1962. Output was mostly fireclay for use in manufacturing refractories and building brick. Leading producers were Climax Division of A. P. Green Fire Brick Co., Climax, and New Bethlehem Tile Co., New Bethlehem.

Sand and gravel output declined more than 20 percent from that of 1962, owing mainly to less demand for paving sand. Glacial Sand & Gravel Co. processed virtually all of the material at its Parker No. 2 plant.

Clearfield.—The county continued as the leading clay producing area in the State in terms of both tonnage and value. Twenty-four mines produced 465,219 tons of clay, valued at $3.3 million. Most of the output was fire clay, mined by or for the major refractory producing companies. Harbison-Walker Refractories Co. with eight operations was the leading producer. Augenbaugh Coal Co., Inc., stripped a significant quantity of fire clay for sale to firebrick manufacturers. Output was chiefly from the areas surrounding Curwensville, Bigler, Grampian, West Decatur, and Osceola Mills.

Coal production increased 4 percent, but the number of active mines decreased by 17 to 170. Of total production, 85 percent was mined at 96 strip mines, 13 percent at 66 underground mines, and 2 percent at 8 auger mines. The county led in strip production. Of the underground output, 69 percent was mechanically loaded by 4 mobile loaders, 4 continuous miners, and 34 face conveyors. There was a decrease of 11 mobile loaders and an increase of 1 continuous miner compared with 1962. Equipment at strip mines included 191 power shovels, 99 draglines, 161 bulldozers, and 2 carryall scrapers. Nine cleaning plants prepared 28 percent of the total output. Three of these plants had thermal drying equipment.

Clinton.—Coal production from four strip and two underground mines increased 18 percent. Almost all the coal was strip mined. Equipment included 11 power shovels, 4 draglines, and 10 bulldozers. One heavy media cleaning plant was in operation.

Lycoming Silica Sand Co., Salona, crushed and sized limestone for use as concrete aggregate and roadstone.

Miscellaneous clay was mined by Mill Hall Clay Products, Inc., at Castanea for manufacturing heavy clay products. F. E. Fink & R. H. Stackhouse mined fire clay near Lock Haven for firebrick manufacture. This company reported the depletion of its clay deposit in 1963.

Columbia.—Anthracite production increased 6 percent, to 411,000 tons, but the number of men employed decreased by 82 to 307. Jeddo-Highland Coal Co. was the leading producer.

Output of sand and gravel was slightly lower than the previous year due to lower demand for building sand and gravel. Bloomsburg Sand & Gravel Co. produced processed sand and gravel near Bloomsburg.

The Alliance Clay Product Co. mined miscellaneous clay at Mifflinville for use in manufacturing building brick. Moss and humus peat was recovered from bogs near Benton by Benton Peat Products, Inc.

Crawford.—Sand and gravel production increased for the third consecutive year, but was significantly less than the 142,000 short tons produced in 1959. The sand and gravel was produced by W. L. Dunn, Cochranton; Conneaut Lake Sand & Gravel, Conneaut Lake; and Hasbrouck Sand & Gravel, Titusville. About one-fourth of the output was unprocessed fill.

Cumberland.—Five companies operated limestone quarries producing chiefly crushed limestone for use as road material. Valley Quarries, Inc., Shippensburg; Bonny Brook Quarries, Carlisle; and Hempt Brothers, Inc., Camp Hill, were the leading producers.

Sand and gravel, chiefly for building and paving aggregate, was produced by Hempt Brothers, Inc., Camp Hill; R. A. Bender & Son, Mt. Holly Springs; and C&L Goodhart, Walnut Bottom.

Almost the entire county clay output was kaolin mined by Philadelphia Clay Co. near Mount Holly Springs for use in white cement manufacture.

Dauphin.—Tonnage and value of stone decreased 7 and 15 percent, respectively, as compared with that of 1962. Crushed limestone was quarried by H. E. Millard Lime & Stone Co., Palmyra; Bethlehem Limestone Co., Steelton; and George E. Ebersole & Sons, Hummelstown. Chief uses for the stone were for blast-furnace and open-hearth flux, concrete aggregate, and roadstone. Crushed basalt was quarried near Elizabethville by Faylor Lime & Stone Co. for aggregate and roadstone.

Anthracite production increased 76 percent but the number of men employed dropped by 5 to 181. Gangloff Bros. was the leading producer.

Production of miscellaneous clay for building brick by the Glen-Gery Shale Brick Corp. from pits near Harrisburg and Middletown was at a slightly higher rate than in 1962. Pennsy Supply, Inc., produced chiefly building sand and gravel at its Amity Hill plant at Duncannon. H. E. Millard Lime & Stone Co. produced hydrated aglime at Swatara.

Delaware.—Dimension sandstone was quarried at Media by Media Quarry Co. for use as rough construction stone and rubble. Dimension granite for rough construction was quarried near Lima and Swarthmore. Crushed basalt for the aggregate market was quarried by General Crushed Stone Co., Glen Mills, and V. DiFrancesco & Son, Havertown. Although production decreased slightly from that of

1962, the county continued to rank first in basalt production. General Crushed Stone Co. reported rennovating its processing plant in 1963.

Sinclair Refining Co. produced liquid sulfur as a byproduct in the liquid purification of oil refinery gas using a Claus-type process at its Marcus Hook refinery. Sun Oil Co., Marcus Hook, produced sulfur as a byproduct in single stage catalytic oxidation of hydrogen sulfide.

Perlite Products Co. expanded perlite at its Primos plant from crude material shipped from Colorado. The expanded material was used chiefly as building plaster aggregate, insulating material, concrete aggregate, and a soil conditioner.

Elk.—Coal production increased 47 percent chiefly due to increased strip and auger mining. One additional strip mine (9) and four new auger mines (5) were active, but one less underground mine (15) was in operation. Strip tonnage comprised 68 percent of output, underground 19 percent, and auger 13 percent. Mechanical loading at the underground mines consisted of handloading onto face conveyors. Equipment at strip mines included 20 power shovels, 4 draglines, 18 bulldozers, and 1 carryall scraper. One heavy media cleaning plant was in operation.

Gravel was produced by Stone Haven Mix from a portable plant near Johnsonburg for paving aggregate. No production of fire clay was reported in 1963.

Erie.—The county was third ranked in sand and gravel production in the State. Erie Sand Steamship Co. continued as the leading producer recovering sand by dredging. Six smaller operations were active producing mostly building and paving aggregate.

Corry Peat Products Co. recovered reed-sedge and humus peat from bogs near Corry and sold the material packaged and in bulk.

Sandstone riprap was quarried near Franklin Corners.

Fayette.—Coal production increased 16 percent even though the number of active operations decreased by 4 to 52. Auger production was reported in 1963; there was none in 1962. Over two-thirds of total production was mined underground. Two additional continuous mining machines (11) were put into operation. Ninety percent of underground production was loaded mechanically. Active at the 21 strip mines were 26 power shovels, 12 draglines, 19 bulldozers, and 3 carryall scrapers. Four cleaning plants prepared over two-thirds of total output.

Fry Coal & Stone Co., Division of Martin-Marietta Corp., produced crushed, ground, and sized limestone from the Lake Lynn quarry, Lake Lynn, and the Cool Spring quarry, Uniontown. The stone was sold for use as concrete aggregate, roadstone, dust for coal mines, and agstone. Increased production of crushed sandstone was reported. Connellsville Blue Stone Co. produced aggregate material at Scottdale and General Refractories produced ganister for silica brick. A small quantity of sandstone rubble was produced near Connellsville.

Clay production increased by almost half in 1963, due chiefly to increased fire clay production for firebrick and block manufacture. Fire clay output was reported by Kaiser Refractories and Chemicals Division, Kaiser Aluminum & Chemical Corp., and Harbison-Walker Refractories Co. both at Ohiopyle. Robert N. Mathews mined fire clay at Uniontown for sale to refractory manufacturers.

Reduced production of sand and gravel was reported by McClain Sand Co., Inc., at its dredge located near Point Marion.

Forest.—Tionesta Sand & Gravel, Inc., produced sand and gravel for building and paving at a stationary plant near Tionesta.

Franklin.—Chiefly due to increased roadbuilding in the area, production of stone increased 33 percent. Four producers quarried limestone, the larger of which were Valley Quarries, Inc., Chambersburg and Fry Coal & Stone Co. at Williamson and Zullinger. The limestone was used mainly for concrete aggregate and roadstone. Smaller quantities were sold for agstone and railroad ballast.

Building sand was produced at a stationary plant by Mt. Cydonia Sand Co., Inc., and by Caledonia Sand Co., both at Fayetteville.

Fulton.—H. B. Mellot Estate, Inc., produced limestone at the Morton quarry, Big Cove Tannery, and the Charlton quarry, Warfordsburg. The stone was crushed at local plants chiefly for use as concrete aggregate and roadstone; some was used for agstone.

Building and paving sand was produced at a stationary plant near Warfordsburg by H. B. Mellot Estate, Inc.

Greene.—The county was second ranked in coal production with output of 9.6 million tons, an increase of 5 percent over 1962. Almost all of the production was from 25 underground mines, but 5 small strip pits were in operation. There was a decrease of 3 to 82 in number of continuous miners, and the number of mobile loading machines in use dropped from 29 to 7 in 1963, but in addition, 18 were used behind continuous miners. Almost all the underground tonnage was loaded mechanically. Five cleaning plants prepared over half of the total output mostly by wet washing other than jigs. One plant had thermal drying equipment.

No clay mining operations were active in 1963.

Huntingdon.—The county continued as the leading industrial sand-producing area in the State. High values of this production ranked the county second in value of sand and gravel production while being fourth in tonnage. Industrial sand was produced by Pennsylvania Glass Sand Corp. at its Keystone Works near Mapleton Depot chiefly for sale to the glass industry. Other markets included pottery, foundry, molding, and engine sand uses.

New Enterprise Stone & Lime Co., McConnellstown, and Warner Co., Union Furnace, quarried and crushed limestone for use as concrete aggregate and roadstone. The latter company installed a hammermill with conveyor and screens in a plant improvement project. The Orbisonia quarry of New Enterprise Stone & Lime Co. was idle during the year. L. H. Parsons Stone & Lime Co. (a new producer), Orbisonia, quarried limestone for concrete aggregate, roadstone, and agstone. The closing of Harbison-Walker Refractories Co.'s quarry at Mt. Union, a major sandstone producer in 1962, resulted in sharply decreased county sandstone production. North American Refractories Co. continued its operation at Three Springs producing ganister for silica brick.

A small production of strip (three mines) and underground (four mines) coal was reported. Output was significantly higher than in 1962. Alexandria Fire Clay Co. mined fire clay near Alexandria for sale to mortar manufacturers.

Indiana.—Coal production increased 16 percent as number of active mines rose by 7 to 102. Most of the increased production was in underground-mined tonnage (68 mines) which comprised 86 percent of total output. Four additional continuous mining machines were in use (40) but 2 less mobile loaders (27) were in operation in 1963 at the underground mines. Of total underground output 97 percent was mechanically loaded. At the 33 strip mines, 45 power shovels, 16 draglines, and 47 bulldozers were in use. Nine cleaning plants prepared 76 percent of total production, 27 percent was crushed, and 7 percent was treated for dust allaying and antifreezing purposes. Three cleaning plants used thermal drying equipment.

L. H. Foehrenbach mined fire clay near Clymer for sale to refractory manufacturers.

Jefferson.—Coal production increased 30 percent as nine new mines were opened in 1963. Most of the increased output was attributed to more activity in strip, underground, and auger mining. Of total output, 69 percent was mined at 27 strip pits, 28 percent at 28 underground mines, and 3 percent at 10 auger mines. At underground mines, four additional continuous miners (six) were in operation. In addition, a significant tonnage was hand loaded onto conveyors and two duckbills were in use. Of underground output 86 percent was loaded mechanically. In use at strip mines were 49 power shovels, 16 draglines, 47 bulldozers, and 1 carryall scraper; at the auger mines 13 augering machines were used. Seven coal preparation plants were active, cleaning 45 percent of total production mostly by pneumatic methods. In addition, 61 percent was crushed, and 5 percent was treated.

Production of fire clay increased 73 percent due chiefly to increased consumption in building brick manufacture. In addition, firebrick and block and vitrified sewer pipe were produced. The leading of three producers was the Hanley Co., Summerville, and The Brockway Clay Co. with two operations at Brockway.

Sugar Hill Limestone Co. (a new operator), Brockway, quarried limestone for use as riprap and agstone. Brockway Sand & Gravel produced bank-run gravel near Brockway for paving.

Juniata.—Juniata Limestone Co. produced crushed limestone near McAlisterville, chiefly for use as road material; smaller quantities were sold for cement manufacture, fill, and agstone. Fulkroad Lime Quarry, McAlisterville, produced limestone to manufacture agricultural quicklime. Kaiser Aluminum & Chemical Corp. closed its quartzite quarry near Thompsontown.

Lackawanna.—Anthracite production decreased by 13 percent and the number of men employed dropped from 1,312 in 1962 to 1,086 in 1963. Moffat Coal Co., Inc., and Carbondale Coal Co., Inc., were the leading producers.

Stabler Construction Co. produced crushed sandstone from its West Mountain quarry near Scranton for use as concrete aggregate. New roadbuilding in the area sparked production.

Sand and gravel production increased 25 percent chiefly because of increased markets for building sand and gravel. Producers were Contractors Sand & Gravel, Inc., Madisonville; Scranton Sand & Stone Co., Gouldsboro; and The East Lemon Sand & Gravel Co., Dunmore.

Lancaster.—Production of crushed and broken limestone decreased slightly compared with that of 1962, but the county ranked second in limestone production. Sixteen companies operated 18 quarries mostly near Blue Ball, Talmage, Gap, Silver Springs, and East Petersburg. Leading producers were D. M. Stoltzfus & Son, Inc., Ivan M. Martin, Inc., Binkley & Ober, Inc., and Compass Quarries, Inc. Most of the crushed stone was for use as concrete aggregate and roadstone. Smaller quantities were used for agstone, stone sand, asphalt filler, and lime manufacture.

Anthracite production decreased slightly below that of 1962. Output was from dredging operations on the Susquehanna River.

Sand and gravel production at four operations was at virtually the same rate as that of 1962. Output was mostly sand for building and paving. Some fire or furnace sand also was produced. Milton Grove Sand, Inc., Milton Grove, was the leading producer.

Increased production of clay was recorded as the Glen-Gery Shale Brick Corp., Ephrata, and Lancaster Brick Co., Lancaster, consumed larger quantities of miscellaneous clay in building brick manufacture. Narvon Mines Limited, Narvon, sold fire clay for a variety of specialty uses. The latter company reported renovating its processing plant. Amos K. Stoltzfus produced agricultural quicklime at Elverson.

Lawrence.—Increased shipments of portland cement were reported, but masonry cement sales were less than in 1962. Two cement plants were active, one a four-kiln wet process plant operated by Bessemer Cement Co., Division of Diamond Alkali Co. at Bessemer, the other a two-kiln dry process plant operated by Medusa Portland Cement Co. at Wampum. Production was mostly the general use types and was shipped mainly by truck in bulk to ready-mixed-concrete companies, highway contractors, and concrete-product manufacturers. Shipments were almost evenly divided between Ohio and western Pennsylvania. Bessemer Cement Co. reported the installation of new equipment and improvement of its stone crushing and conveying departments.

Five companies produced crushed limestone and cement rock, mainly for cement manufacture, blast-furnace flux, concrete aggregate, and roadstone. Smaller quantities were used for dust in coal mines, agstone, and roofing paper filler. Bessemer Cement Co., Division of Diamond Alkali, near Bessemer, completed its modernization program in the crushing and screening departments which had started in 1962.

Coal production increased 38 percent because of increased output of the county's 21 strip mines. Only one small underground mine was active. One auger mine, two less than the number in 1962, produced only about half of the 1962 auger output. In use at the strip mines were 29 power shovels, 20 draglines, 27 bulldozers, and 1 carryall scraper. There were no active mechanical cleaning plants in 1963, but 17 percent of county output was crushed.

Clay production reported by eight producers increased 15 percent over 1962. Almost equal quantities of fire clay and miscellaneous clay were produced. Leading markets were the cement and steel industries. In addition, large quantities of building brick were produced. The leading producers were Ralph A. Veon, Inc., Enon Val-

ley, and Bessemer Cement Co., Division of Diamond Alkali Co. at Bessemer. Ralph A. Veon, Inc. installed a new dragline at its pit.

Three operators produced sand and gravel mostly for building and paving. The leading producer was Mahoning Valley Sand Co., West Pittsburg. Reed-sedge and humus peat, sold in bulk, was produced by D. M. Boyd near New Wilmington. Humus peat was recovered from a bog in Washington Township by Moore's Humus & Nursery. Zonolite Co. exfoliated crude vermiculite shipped from Montana and South Carolina at its Ellwood City plant.

Lebanon.—Crude magnetite, containing valuable byproducts such as copper, gold and silver, pyrites, and cobalt, was mined by Bethlehem Cornwall Corp. at Cornwall. The crude ore was processed in the Cornwall concentrator by crushing and grinding, magnetic separation, flotation, and agglomeration to recover all valuable byproducts.

Five producers operated limestone quarries near Lebanon (2), Annville (2), and Cornwall. The leading producers were H. E. Millard Lime & Stone Co. and Calcite Quarry Corp. The crushed limestone was for use primarily for road material, cement and lime manufacture, and metallurgical flux. Small quantities were for agstone and railroad ballast. Dimension limestone for rough construction was quarried near Myerstown. Calcite Quarry Corp., near Lebanon, installed additional crushing equipment and replaced the washing equipment at its limestone processing plant.

Quicklime and hydrated lime was produced at Annville by H. E. Millard Lime & Stone Co. chiefly for sale to the steel industry, for water purification, and for Mason's lime.

Anthracite production more than tripled over that of 1962 to 44,000 tons due to the large output of Talbot Realty Co., Inc., the leading producer.

Lehigh.—Sphalerite was mined by New Jersey Zinc Co. at Friedensville. The crude production was concentrated by flotation at the mine and shipped to Palmerton for recovery of the zinc metal.

The county continued to rank second in shipments of both portland and masonry cements. Portland cement shipments decreased slightly but sales of masonry cement were greater than those in 1962. Average prices for portland cement fell from $3.20 to $2.89 per barrel reflecting the current tight marketing structure along the Eastern seaboard. Four cement companies were in operation. They were The Whitehall Cement Manufacturing Co. (7-kiln dry process plant at Cementon), Lehigh Portland Cement Co. (10-kiln dry process plant at Fogelsville), Giant Portland Cement Co. (8-kiln dry process plant at Egypt), and Coplay Cement Manufacturing Co. (3-kiln dry process plant at Coplay). Output was general use and high-early-strength types for shipments chiefly to consumers in eastern Pennsylvania, New York, New Jersey, Virginia, and Delaware. The leading consumers were ready-mixed concrete companies and building material dealers.

Coplay Cement Manufacturing Co., Coplay, The Whitehall Cement Manufacturing Co., Cementon, Lehigh Portland Cement Co., Fogelsville, and Giant Portland Cement Co., Egypt, quarried and crushed cement rock at local plants and utilized the stone for manufacturing

cement. Roy J. Kern, Schnecksville, Eastern Lime Corp., Stiles, and Lehigh Stone Co., Ormrod, quarried and crushed limestone chiefly for concrete aggregate and roadstone. Dimension slate was quarried near Slatedale by Penn Big Bed Slate Co., Inc., for sale for a wide variety of uses chief among which were structural and sanitary, blackboards, billiard table tops, and flagging.

Semiprecious agates, quartz crystals, and corundum, were collected near Friedensville. Crude perlite shipped from mines in Colorado, was expanded by Pennsylvania Perlite Corp. The material was marketed mainly as plaster aggregate, loose-fill insulation, and soil conditioning.

Luzerne.—Anthracite production increased 11 percent. The number of men employed increased slightly to 4,684. The county was the first ranking area in anthracite production with output of 6.8 million tons. Leading producers were Glen Alden Corp., Lehigh Valley Anthracite, Inc., Susquehanna Coal Co., Jeddo-Highland Coal Co., George Rancho, and Hudson Realty Co., Inc.

There was a 75-percent increase in crushed sandstone production to meet the aggregate requirements of new highway projects in the area. Producers were Coolbaugh Sand & Stone Co., Inc., Dupont, General Crushed Stone Co., White Haven, and American Asphalt Paving, Shavertown. Coolbaugh Sand & Stone Co., Inc., installed a twin-jaw crusher.

Sand and gravel production increased 7 percent in 1963. The chief market was paving aggregate. Six operations were active, the leading of which were Airport Sand & Gravel Co., Inc., Wyoming, Frank B. Sgarlat Sand & Gravel Co., Forty Fort, and J. A. & W. A. Hess, Inc., Nescopeck.

The county led in value of peat production increasing 9 percent from that of 1962. Humus peat was recovered from a bog near White Haven by Blue Ridge Soil Pep Co., Inc., and was sold in bulk. Moss, reed-sedge, and humus peat was recovered from bogs near White Haven by Pennsylvania Peat Moss, Inc.

The Hazelton Brick Co. mined miscellaneous clay near Hazelton for manufacturing building brick.

Lycoming.—Lycoming Silica Sand Co. quarried and crushed limestone at its Lime Bluff quarry, Muncy, and Pine Creek quarry, Jersey Shore, chiefly for concrete aggregate and roadstone. In addition, crushed limestone for agstone was produced at the company's Pine Creek quarry. Susquehanna Quarry Co. operated a quarry and portable plant near Jersey Shore to produce limestone for road-building material. Some of the stone was sold to Government agencies for road construction. Small quantities of dimension sandstone for rough construction and flagging were produced. Crushed slate was crushed and ground to flour by Keystone Filler Manufacturing Co., Muncy.

Lycoming Silica Sand Co. produced chiefly building and paving sand and gravel at a stationary plant near Montoursville. Some industrial sand also was produced.

Only three coal mines were active, two of which were strip mines where 93 percent of total output was mined. Three power shovels, two draglines, and two bulldozers were in use at these pits.

Penn Paint & Filler Co., Antes Fort, and Keystone Filler & Manufacturing Co., Muncy, quarried tripoli (rottenstone). After crushing, drying, and pulverizing, the material was marketed for use as an abrasive and filler.

McKean.—Hanley Co. mined miscellaneous clay at Lewis Run for manufacturing heavy clay products. Kness Brothers mined fire clay at Mt. Jewett for sale to foundries and steelworks.

Three small coal strip mines were active. C. L. McGavern produced sand for open-hearth furnaces at Eldred.

Mercer.—Twelve strip mines were in operation producing almost 1 million tons of coal, but this was a 13-percent decrease below 1962. No underground mines were active in 1963. Equipment in use at the strip mines included 15 power shovels, 14 draglines, 23 bulldozers, and 1 carryall scraper. One pneumatic preparation plant was in operation, but 19 percent of county output was cleaned (some in Butler County). Of total output one-third was crushed but there was no treatment.

Sand and gravel production increased 45 percent responding to increased demand for paving aggregate. Producers were Seidle Sand & Gravel Co., Mercer, Transfer Sand & Gravel Co., South Pymatuning, and Taylor Sand & Gravel Co., Big Bend.

Crushed sandstone for sales to a wide variety of consumers was quarried by White Rock Silica Sand Co. near Greenville. Arthur J. Gobbie quarried dimension sandstone near Leesburg for rough construction uses. This company installed a new quarry derrick.

Mifflin.—Ganister for silica brick was produced by Haws Refractories Co. at Hawstone. The Pennsylvania Glass Sand Corp. produced industrial sand at its Hatfield Works near McVeytown. Output was chiefly grinding and polishing and glass sand. Three other operations, producing chiefly building or paving material, also were active.

Crushed limestone, chiefly for use as blast-furnace flux, concrete aggregate and roadstone, and stone sand, was quarried by Bethlehem Limestone Co. at its Naginey quarry. The company improved its plant by installing an impact crusher and a covered storage bin. George E. Miller Coal Co., McVeytown, quarried limestone for concrete aggregate and road material. Honey Creek Lime Co., Reedsville, and Ehrenzeller Lime Co., McVeytown, quarried and crushed limestone for manufacturing aglime.

Monroe.—Crushed and broken limestone for use as concrete aggregate, road material, and the manufacture of cement, was produced by Hamilton Stone Co., Inc., Bossardsville. Some of the stone was sold to the State highway department for road construction.

Sand and gravel entirely for building uses was produced by Sheesley's Minerals, Inc., Kunkletown and Javelyn Mobile Mix, Inc., Stroudsburg.

The Universal Atlas Cement Division, United States Steel Corp., mined miscellaneous clay at Kunkletown for its own use in cement manufacture. A quantity of mineral specimens, including petrified corals, were collected near Stroudsburg. No peat production was reported in 1963.

Montgomery.—Production of stone exceeded 4 million tons, and the county continued to rank second as a stone-producing area. Quarries

were operated near Conshohocken by Glasgow Quarry, Inc., and near Norristown by Bradford Hills Quarry, Inc., to produce crushed and broken limestone for concrete aggregate and roadstone. Limestone quarried and crushed near West Conshohocken by Allentown Portland Cement Co. was used for manufacturing cement. Quarries operated near Plymouth Meeting by G. & W. H. Corson, Inc., and near Bridgeport by Bethlehem Limestone Co. produced crushed limestone mainly for flux in iron and steel plants, concrete aggregate, road material, lime manufacture, and in magnesium-metal plants. Firestone Products Co., Inc., quarried crushed and dimension sandstone at Glenside, the former for refractory and roofing granule uses, the latter for rubble and rough architectural uses. William Bambi & Sons, Inc., quarried irregular shaped facing and other stone near Norristown.

Mignatti Construction Co., Inc., produced crushed granite for concrete aggregate plus a quantity of dimension stone near Bethayres. Crushed basalt for concrete aggregate and roadstone was produced by Montgomery Stone Co., Inc., Montgomeryville, R. K. Kibblehouse, Perkiomenville, and Pottstown Trap Rock Quarries, Inc., Sanatoga. Montgomery Stone Co., also quarried dimension basalt for both rough and dressed construction uses. R. K. Kibblehouse installed a new crusher, screens, and storage bins.

Allentown Portland Cement Co. operated its three-kiln wet process plant at West Conshohocken producing both portland and masonry cements. Shipments of portland cement were slightly higher than in 1962, but price cuts reduced cash income from these sales. Production was entirely the general-use type which was shipped by both rail and truck, mostly in bulk form, to ready-mixed concrete companies in eastern Pennsylvania.

G. & W. H. Corson, Inc., produced mostly hydrated lime at Plymouth Meeting for consumption as Mason's lime and for the chemical market.

Clay production dropped significantly. Fire clay had been produced in 1962, but output in 1963 was entirely miscellaneous clay. Producers were The Robinson Clay Product Co. (vitrified sewer pipe), Pottstown; Philadelphia Brick Co. (heavy clay products), Trappe; and The Keller Pottery Co. (pottery), North Wales. The Philadelphia Brick Co. reported installation of a new power shovel and loader.

A small quantity of building sand was produced near Norristown. Zeolite and lead ore mineral specimens were collected in the county. Refractory & Insulation Corp., Port Kennedy, expanded crude perlite shipped from mines in Colorado. The Phillip Carey, Plymouth Meeting, perlite expanding plant was dismantled during the year.

Montour.—Lycoming Silica Sand Co., Milton, produced limestone for concrete aggregate, roadstone, and agstone. Mausdale Quarry Co., Danville, quarried and crushed limestone for concrete aggregate and roadstone. A small quantity of sand and gravel was produced at two pits near Danville.

Northampton.—The county continued as first ranking in production of both portland and masonry cement with shipments of almost three times the next ranking county. Ten cement plants with a total of 51 kilns were in operation with capacity to produce 26.5 million barrels.

Three plants were located at Nazareth, two at Bath, two at Northampton, and one each at Martins Creek, Stockerton, and Broadhead. Lehigh Portland Cement Co.'s Sandt's-Eddy plant was shut down. Three of the plants used the wet process; seven used the dry process. Keystone Portland Cement Co. at Bath was the largest producer in 1963. Production of portland cement was reduced by 3 percent, and the average value per barrel dropped from $3.29 to $2.98. Masonry cement sales and prices also were reduced. Most of the portland cement production was the general-use type, but significant quantities of high-early-strength cement also were produced. Shipments, which were almost evenly divided between trucks and the railroad, were chiefly to consumers in eastern Pennsylvania, New Jersey, New York, and the New England States. Ready-mixed concrete companies were the largest consumers. Penn Dixie Cement Co. took its No. 6 plant out of operation in 1963. Alpha Portland Cement Co.'s Martins Creek plant suffered fire damage to its powerhouse section. Whitehall Cement Manufacturing Co. was in the midst of a large-scale improvement plan which involved replacement of considerable equipment. Capacity of white portland cement was expected to be increased.

Northampton County continued as the leading stone-producing county although production dropped to 4.9 million tons, compared with 5.5 million tons in 1962. Nine cement firms produced cement rock from quarries near Nazareth (three), Northampton (two), Bethlehem (one), Bath, Stockertown, and Martins Creek for cement manufacture. In addition to the cement companies, limestone quarries were operated by Bethlehem Steel Co., Bethlehem, and The Trumbower Co., Inc., Nazareth, and crushed stone was sold for riprap, stone sand, agstone, and railroad ballast. The county was the center of the State's slate industry with production valued in excess of $3.5 million. Nine quarries were operated; the larger of which in terms of value of output were Anthony Dally & Sons, Inc., Stephens-Jackson Co., D. Stoddard & Sons, Inc., Diamond Slate Co., and Doney Slate Corp., all of Pen Argyl. Slate output was mainly for flagging, for structural and sanitary uses, for blackboards, and for roofing. Production decreased slightly but values increased. Crushed slate also was produced from slate waste. Pennsylvania Lightweight Aggregate, Inc., processed waste slate into lightweight aggregate at a new rotary-kiln plant near Bangor.

Sand and gravel production increased slightly to meet increased demand for building aggregate. Houdaille Construction Materials, Inc., Portland; W. J. Lowe & Sons, Inc., Bangor; and Lehigh Valley Sand & Gravel Co., Inc., Easton, produced in 1963.

Northumberland.—Anthracite production increased 24 percent to 2.0 million tons. This was reflected in the 42-man increase in employment to 1,912 men. The leading producers were the Susquehanna Coal Co., Reading Anthracite Co., and Rosini Coal Co.

Clay production, which was entirely miscellaneous clay chiefly for building brick manufacture, increased over that of 1962. The leading of three producers was the Glen-Gery Shale Brick Corp. at Watsontown. This company reported the installation of automatic pugging equipment and new equipment for the clay pit.

Limestone quarried near Herndon and Northumberland was crushed for use as road material, agstone, and for agriculture lime manufacture.

Perry.—Bradford Hills Quarry, Inc., Newport, quarried and crushed limestone for concrete aggregate and roadstone. Most of the stone was sold to the State highway department and local townships for road construction.

Philadelphia.—Reduced production of building sand and gravel was reported by The Liberty Corp. at its dredging operation on the Delaware River near Philadelphia.

Gulf Oil Corp. recovered sulfur as a byproduct in the liquid purification of oil refinery gas at its Philadelphia plant using the Claus process. Atlantic Refining Co. recovered hydrogen sulfide by the Girdler system, using diethanolamine and monethanolamine, for use in sulfuric acid manufacture.

Potter.—Dimension sandstone was produced at eight quarries for use chiefly as flagging. The leading producers were Penn Kress Flagstone Co., Austin, and Rummings & Wright, Wharton.

Schuylkill.—Anthracite production in the second-ranked producing county increased 5 percent to 6.5 million tons, but employment dropped by 269 to 4,873 men. The leading anthracite producers were Reading Anthracite Co., Greenwood Stripping Co., Mammoth Coal Co., Honeybrook Mines, Inc., Gilberton Coal Co., and Lehigh Valley Anthracite, Inc.

Russ Contracting Co., Andreas, and Pennsylvania Aggregates, Inc., Summit Station, produced limestone for use as concrete aggregate and roadstone. Crushed sandstone was produced by Summit Quarries, Inc., Summit Station, for the aggregate market and by Harbison-Walker Refractories Co. at the Andreas quarry for silica brick.

Refractory Sand Co., Inc. produced paving sand and sand for furnace bricks at a stationary plant near Andreas.

Miscellaneous clay was mined by three producers. The leading producer was Lehigh Materials Co. which produced lightweight aggregate from shale supplied by various producers. Building brick was produced by the other clay mining companies.

Snyder.—National Limestone Quarry, Middleburg, quarried and crushed limestone for use as road materials and agstone. Carton L. Comfort, Mount Pleasant Mills, produced crushed limestone and manufactured agricultural lime.

Central Builders Supply Co. produced building sand and gravel and paving sand at a stationary plant near Selinsgrove. Anthracite production increased slightly. Miscellaneous clay was mined by the Paxton Brick Co., near Paxtonville, for building brick.

Somerset.—Coal production increased 29 percent chiefly due to increased strip-mined production as 14 new strip mines were in operation. Three less underground mines were active but production increased slightly. Of total production 58 percent was mined at 49 strip pits, 41 percent at 78 underground mines, the balance at 2 auger mines. One additional continuous miner was in use bringing the total to seven. In addition, 2 mobile loaders and 27 hand-loaded face conveyors were active. Overall, 71 percent of underground production was loaded mechanically. Strip mining equipment included 82 power shovels, 50 draglines, and 84 bulldozers. The county was third rank-

ing in strip coal production. No cleaning plants were in operation.

Almost doubled output of fire clay was reported mainly to meet the refractory demands of the steel industry. Eight pits were active, three of which were operated by General Refractories Co., one at Fort Hill and two at Rockwood. Other large producers included C. Brant Mining Co., Somerset, and Hiram Swank's Sons, Inc., Holsopple.

Somerset Limestone Co., Inc., quarried and crushed limestone at its Bakersville quarry for road material. Keystone Lime Co., Springs, produced crushed limestone for use as concrete aggregate, roadstone, and agstone. Crushed sandstone for aggregate was produced by Detwilers Industries, Inc., Central City, and Clarence Rodamer, Springs. A small quantity of sand and gravel was produced near Berlin and Boswell.

Sullivan.—Anthracite production decreased slightly below that of 1962. Only 11 men were employed by the industry, a drop of 8 from employment in 1962.

Susquehanna.—Crushed sandstone for aggregate was produced by Keelor Supply Co., Inc., Clifford, and Susquehanna Quarry Co., Montrose. Dimension sandstone chiefly for flagging was produced at a rate more than four times greater than in 1962 by six producers. The leading were Powers & Powers, Birchardville, and Susquehanna Bluestone Co., Susquehanna. Keelor Supply Co., Inc., installed a blacktop plant at its quarry. Three of the dimension sandstone producers reported installing new equipment.

No production of anthracite was reported.

Tioga.—Most of the county's coal production was mined at five strip mines; one small hand loading underground mine also was active. Stripping equipment included 16 power shovels, 8 draglines, and 13 bulldozers.

A small quantity of dimension sandstone was quarried in Elk Township.

Union.—Limestone, crushed chiefly for concrete aggregate and roadstone, was quarried near Winfield and Mifflinburg. The State highway department purchased some of the stone for road construction.

Venango.—Coal production more than doubled. Eleven strip mines and two auger mines were active compared with six strip mines and no auger mines in 1962. Stripping equipment included 23 power shovels, 9 draglines, 22 bulldozers, and 2 carryall scrapers. A jig preparation plant cleaned about one-third of total output.

Industrial Silica Division, Pennsylvania Glass Sand Corp., produced molding and fire or furnace sand at its Venango Works near Utica. Three other operations were active producing building and paving material, the largest of which was Oil City Sand & Gravel Co.'s dredging operation near Oil City.

Warren.—Sand and gravel production increased 34 percent. Output, mostly for building and paving, was reported by General Concrete Products Corp., Nelson & Ellberg, and Warren Sand & Gravel Co., Inc., all located near Warren.

Washington.—The county was the leading coal producing area with production of 12.2 million tons, an increase of 11 percent over 1962. Most of the output (93 percent) was from 21 underground mines, the balance from 14 strip mines and 3 auger mines. Almost all of the

underground production was loaded mechanically. A decrease of 9 was recorded in number of continuous mining machines in use (63), but the number of mobile loading machines (69) remained constant. Stripping equipment included 26 power shovels, 7 draglines, 29 bulldozers, and 4 carryall scrapers. Nine cleaning plants were in operation preparing 83 percent of total output. In addition, 53 percent was crushed and 9 percent was treated.

Crushed and broken limestone for use as road material was quarried near Washington by Washington Stone Co. Fire clay was recovered in conjunction with the limestone mining. Crushed sandstone for aggregate was quarried by Fry Coal & Stone Co. at a portable plant near Claysville.

Wayne.—Crushed sandstone for aggregate was quarried by Wayne Concrete & Sand Works, Inc., at Lake Ariel. Dimension sandstone chiefly for flagging was quarried by W. R. Strong & Son and Sterling Quarries, Inc.

A small quantity of anthracite was produced in 1963. Wayne Peat Humus Co. recovered moss and humus peat from bogs near Roaring Brook. Sand and gravel was produced by two operators near Lake Ariel.

Westmoreland.—Coal production increased 8 percent. Increased output of underground-mined coal was reported, even though five fewer mines were in operation. Seven new strip mines were opened. Of total production, 95 percent was mined at 37 underground mines, the balance at 31 strip mines and 1 auger mine. In use at the underground mines were 8 less continuous miners (14) and 2 less mobile loaders (26). Of underground output 98 percent was mechanically loaded. Six cleaning plants prepared 79 percent of total output. Three of these plants had thermal drying equipment. In addition, 52 percent was crushed and 28 percent was treated chiefly with oil.

Limestone was quarried and crushed for road material near Penn and Lower Burrell. Agricultural Lime & Stone Co., Derry Township, (a new producer) produced and crushed limestone for use as concrete aggregate, roadstone, agstone, and for manufacturing aglime. The county led in crushed sandstone production with output of almost 650,000 tons. Producers were Latrobe Construction Co., Ligonier, Eidemiller Enterprises, Inc., Lycippus, J. M. Hall and J. M. Hall, Jr., Inc., Baggaley, and Clayton H. Remaley, Murrysville. Dimension sandstone flagging was quarried by Lynns Quarry, and John C. Beaumont quarried sandstone rubble, both at Belle Vernon.

Wyoming.—J. G. Robinson, Inc., produced dimension sandstone (bluestone) near Fort Washington for flagging. Sand and gravel mainly for building and paving was produced by Wyoming Sand & Stone Co., and East Falls Sand & Gravel, both at Falls.

York.—Portland and masonry cement was produced by Medusa Portland Cement Co. at York. A $7 million reconstruction was completed at the plant. Original capacity was practically doubled. The old gray cement plant was dismantled, and current capacity was in white cement.

York County ranked fourth in stone production in 1963 as compared with fifth place in 1962. Limestone was produced at 10 operations, 6 near York, 2 near Thomasville, and 1 each near Mount Wolf

and Wrightsville. Chief uses of the crushed stone were as concrete aggregate, roadstone, open-hearth and blast-furnace flux, the manufacture of cement and lime, and agstone. Smaller quantities were sold or used for glassmaking, asphalt fill, whiting, and mineral food. The Ruberoid Co. produced crushed slate for granules and flour at a quarry and plant near Delta.

Dead-burned dolomite was produced by The J. E. Baker Co., near York, mainly for consumption within the State but with sales to other Eastern States plus exports.

Glen-Gery Shale Brick Corp and Medusa Portland Cement Co. mined miscellaneous clay near York. The former company produced building brick and the latter used the clay in cement manufacture.

Building sand and gravel and paving sand was produced by Pennsy Supply, Inc., York Haven, and building sand was produced by Neuman Sand & Supply Co., York.

Pennsylvania Perlite Corp., York, expanded crude perlite shipped from Colorado mines. General Mining Associates, Glenville, was the only mica producer in the State. The scrap mica was sold mostly for use in paints, rubber, and welding rods.

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